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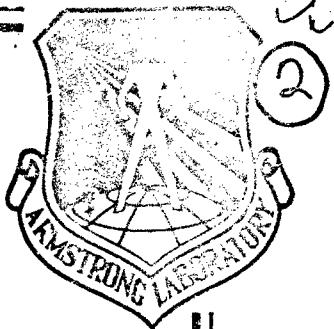
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HORIZONTAL IMPACT TESTS OF THE ADVANCED DYNAMIC ANTHROPOMORPHIC MANIKIN (ADAM)

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BIODYNAMICS AND BIOCOMMUNICATIONS DIVISION

JUNE 1990

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PREFACE

The tests described within this report were accomplished by the Crew Protection Branch, Biodynamics and Bioengineering Division of the Armstrong Laboratory. The test and evaluation effort was accomplished at the request of the Crew Escape Technologies (CREST) Advanced Development Program Office (ADPO), Human Systems Division. Major Kenneth W. Nelms was the CREST program manager.

The impact facilities, data acquisition equipment, and data processing system were operated by the Scientific Services Division of DynCorp under Air Force contract F33615-86-C-0531. Mr Marshall Miller was the Engineering Supervisor for DynCorp.

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LIST OF ABBREVIATIONS

| | |
|-------|---|
| ADAM | Advanced Dynamic Anthropomorphic Manikin |
| ADACS | Automatic Data Acquisition and Control System |
| CRIB | CREST Interface Board |
| DECOM | ADAM Decommutator Data Transmission System |
| DRASS | ADAM Data Retrieval and Storage System |
| NSD | No Significant Difference |
| RAM | ADAM On-Board Data Storage System |
| RCAL | ADAM Calibration Voltage |
| SRL | Systems Research Laboratories, Inc. |

INTRODUCTION

Background

These tests were sponsored by the CREST ADPO to test and evaluate the production Advanced Dynamic Anthropomorphic Manikins (ADAMs) prior to their use in high cost ejection tests of CREST technologies at Holloman Air Force Base.

Two versions of ADAM were tested. Large ADAM approximates 97th percentile military flying personnel in height and weight. Small ADAM is approximately 3rd percentile. The ADAMs are designed to closely approximate the dynamic characteristics of the human body and are heavily instrumented to provide force, displacement, and acceleration data at key positions within the manikin.

To make the ADAM tests as realistic as possible, test fixtures were used which closely model the actual CREST seat. This was accomplished by the use of the correct seat back angle (-Gx tests), accurate representations of the seat back and seat pan, the actual CREST cushions, and the proposed harnesses.

The ADAMs were tested with two configurations of the CREST restraint harness. These are known as the X-Band 90° Hybrid (Figure 1) and the X-Band 45° Hybrid (Figure 2). The upper section is identical for both harnesses. The main difference between the 90° harness and the 45° harness is in the location of the attachments between the lower section of the harness and the seat. The 45° harness attaches to the seat with a pair of vertical straps and a second pair of attachments oriented at an angle of 45° with respect to the seat back tangent line. The 90° harness attaches to the seat with a pair of vertical straps and a second pair of attachments oriented at an angle of 82° with respect to the seat back tangent line.

Objectives

The test program had four objectives:

- (1) To demonstrate the structural integrity of the ADAMs and their instrumentation systems.
- (2) To demonstrate the functional capability of the ADAM instrumentation system when undergoing impact.
- (3) To measure the dynamic response of the ADAMs by measurement of restraint load-time histories and body motion.
- (4) To demonstrate the stability of the production ADAM electronics with respect to the pre-test sensor sensitivities.

Evaluation Criteria

The ADAMs were considered to have successfully met the test objectives if the following conditions were met:

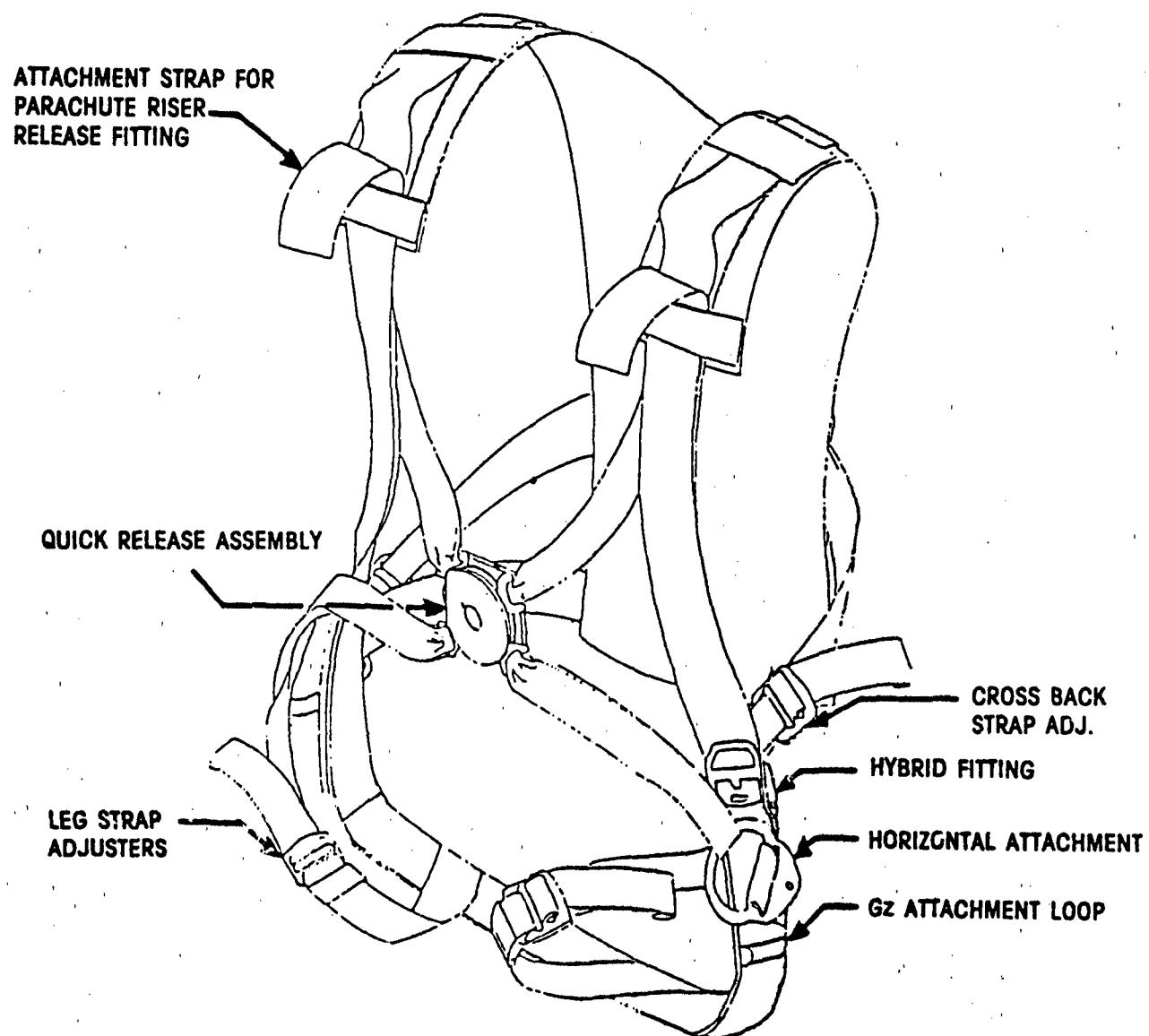


Figure 1: X-Band 90° Hybrid Harness

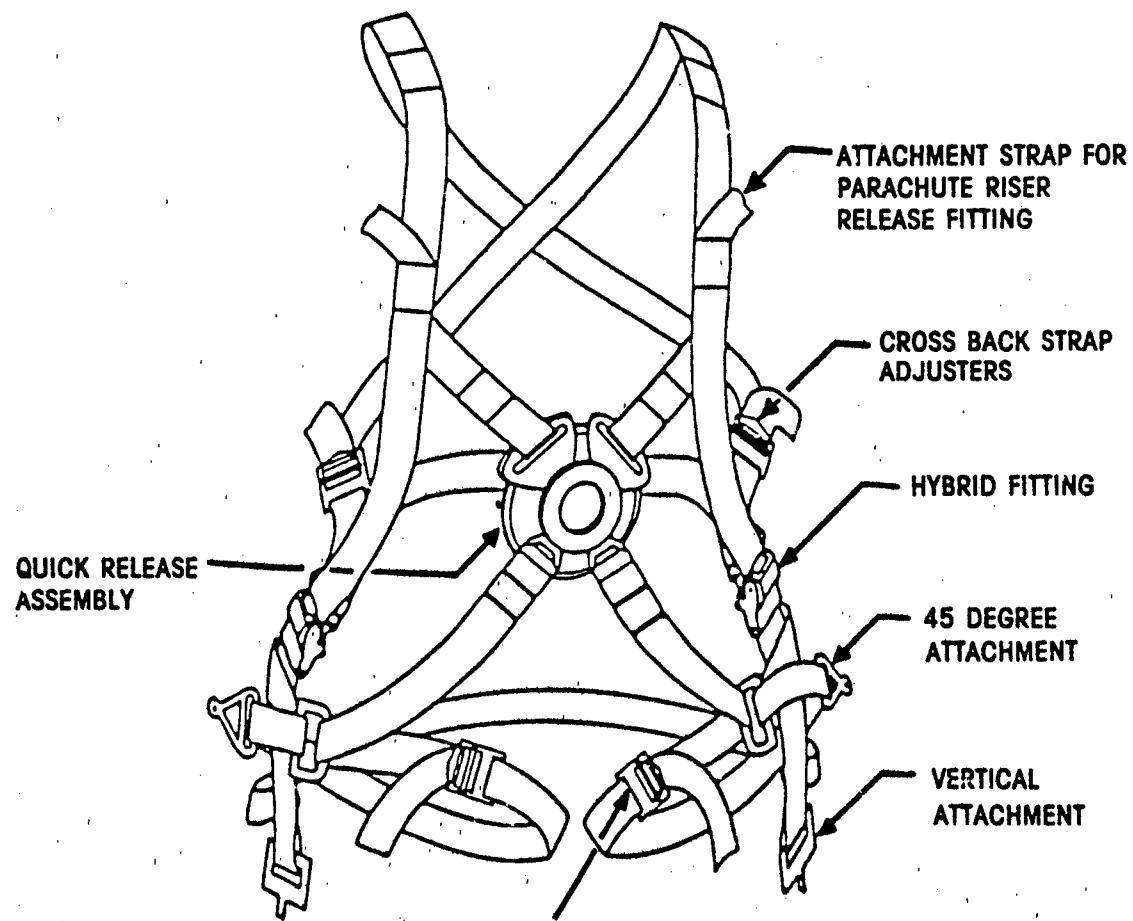


Figure 2. X-Band 45° Hybrid Harness

- (1) The ADAMs showed no permanent deformation or failure of mechanical structures.
- (2) There were no failures of any instrumentation associated with the nine channels designated critical.
- (3) Critical channel data were present and continuous throughout each test.
- (4) Critical channel data recorded from ADAM parallel sensor taps, RAM, and telemetry port agree within 5% in terms of amplitude and phase.
- (5) ADAM dynamic response closely models human dynamic response.

The nine critical channels for x-axis tests were:

1. Internal Temperature
2. Head Z Acceleration
3. Head X Acceleration
4. Chest X Acceleration
5. Head/Neck X Force
6. Head/Neck Z Force
7. Lumbar X Force
8. Lumbar X Acceleration
9. Neck Y-Axis Moment

The nine critical channels for y-axis tests were:

1. Internal Temperature
2. Head Z Acceleration
3. Head Y Acceleration
4. Chest Y Acceleration
5. Head/Neck Y Force
6. Head/Neck Z Force
7. Lumbar Y Force
8. Lumbar Y Acceleration
9. Neck X-axis Moment

Figure 3 shows the seat coordinate system.

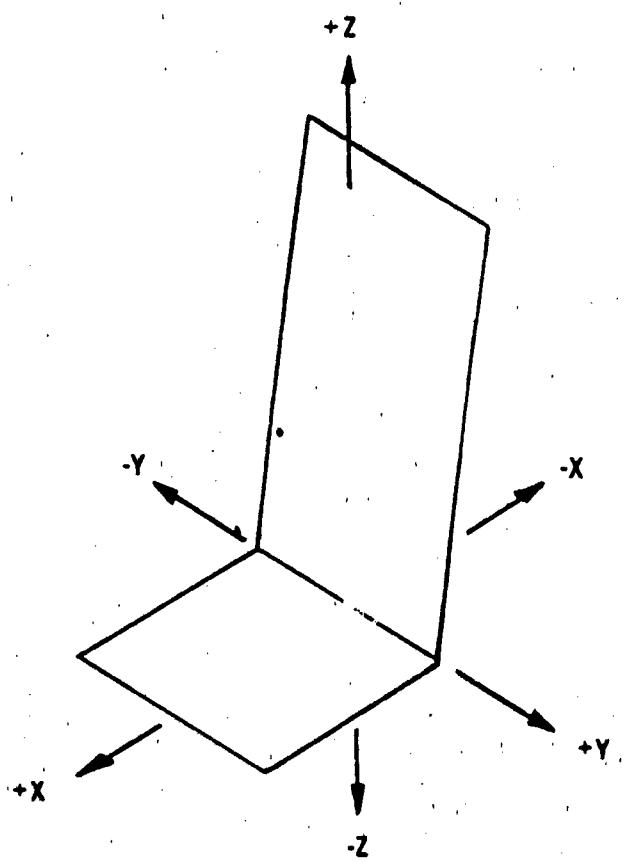


Figure 3: Acceleration Coordinate System

METHODS

Facilities and Associated Procedures

The impact tests were performed using the Armstrong Laboratory (AL) Impulse Accelerator (Shaffer, 1976). The facility consists of a gas-operated actuator, a test sled, and track rails as shown in Figure 4.

Mounted to the sled was a generic seat, modified to represent the CREST ejection seat in an F-16 configuration. For the -Gx tests, the seat was placed on a 17° wedge to attain the correct 30° seat back angle (Figure 5). This wedge was not used for the +Gy tests to avoid large overturning moments. The seat back angle for the +Gy tests was 13° (Figure 6). The sled was ballasted to maintain a constant subject plus ballast weight of 220 lbs.

An outline of the test procedures follows: After Systems Research Laboratories Inc. (SRL) personnel had prepared the ADAM, it was brought to the test track. The ADAM was dressed in modified long underwear, boots, and for the +Gy tests, a flight helmet as well. The ADAM was placed in the seat and instrumentation "zeroes" were recorded. The ADAM was then strapped in and harness tensions were adjusted to try to achieve 20 ± 5 lbs first in the horizontal anchors and then in the shoulder straps. This could not always be achieved, particularly with the small ADAM. No shoulder tension at all could be obtained for the small ADAM, so prior to -Gx testing an additional cushion was placed behind the small ADAM's back which allowed a small shoulder preload to be obtained (Figure 7).

Once preloads had been set, SRL personnel performed a pre-test check. Still photographs were taken of the test setup. The actual impact test was then carried out.

Primary measurements taken during the impact tests consisted of impact sled acceleration and velocity, loads measured at the attachment points of the restraint system, displacements of targets mounted on the ADAM, chest accelerations measured by an externally mounted accelerometer, and data from the nine critical channels listed earlier.

After each test photographs were again taken of the manikin. The ADAM was left undisturbed in the seat until it had downloaded all of its data.

Table 1 shows the sequence of tests performed for this program. Each ADAM was tested up to 14 G in the +y direction with both the X-Band 45° and X-Band 90° harnesses. The small ADAM was tested up to 45 G in the -x direction with both harnesses. The large ADAM was tested up to 45 G in the -x direction with the X-Band 90° harness but only to 30 G with the X-Band 45° harness. Testing was stopped at 30 G because it appeared likely that the 3400 lb design load for the 45° anchor strap would be greatly exceeded at higher G-levels.

Back-to-back tests at 20 G in the -x direction were run with each ADAM using the X-Band 45° harness. The same was done with the X-Band 90° harness at 30 G. The purpose of these tests was to check the repeatability of the ADAM data.

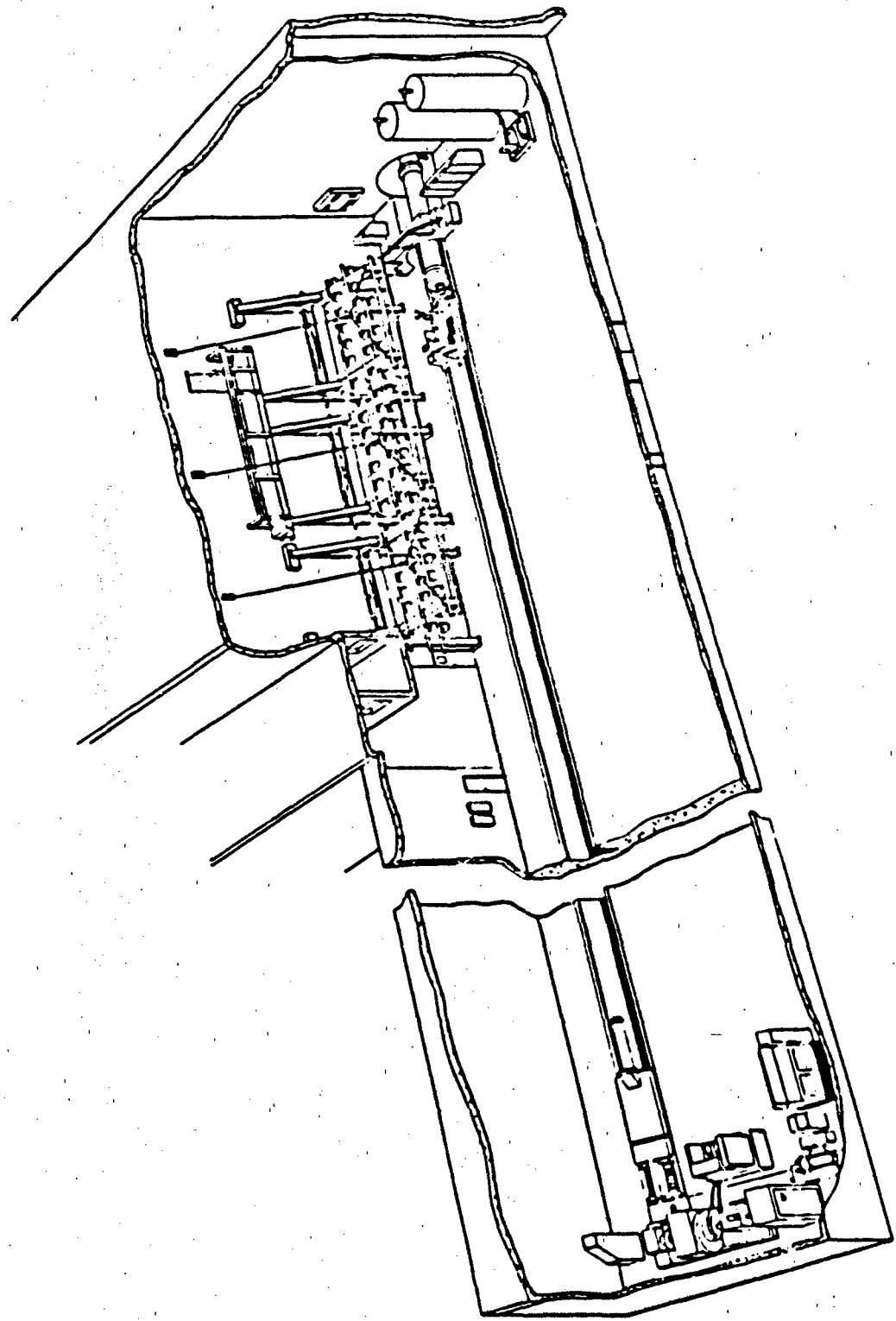


FIGURE 4. IMPULSE ACCELERATOR FACILITY

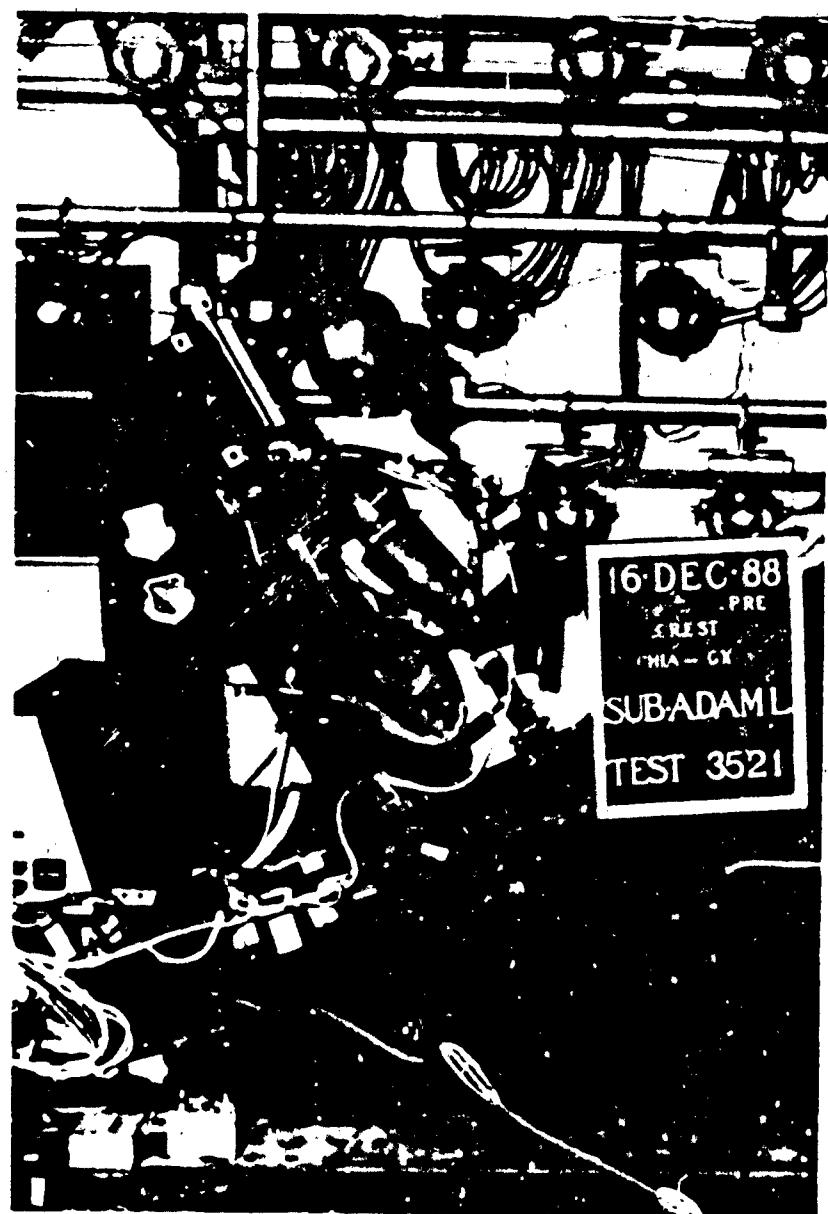


FIGURE 5: SLED SETUP FOR -Gx TESTING

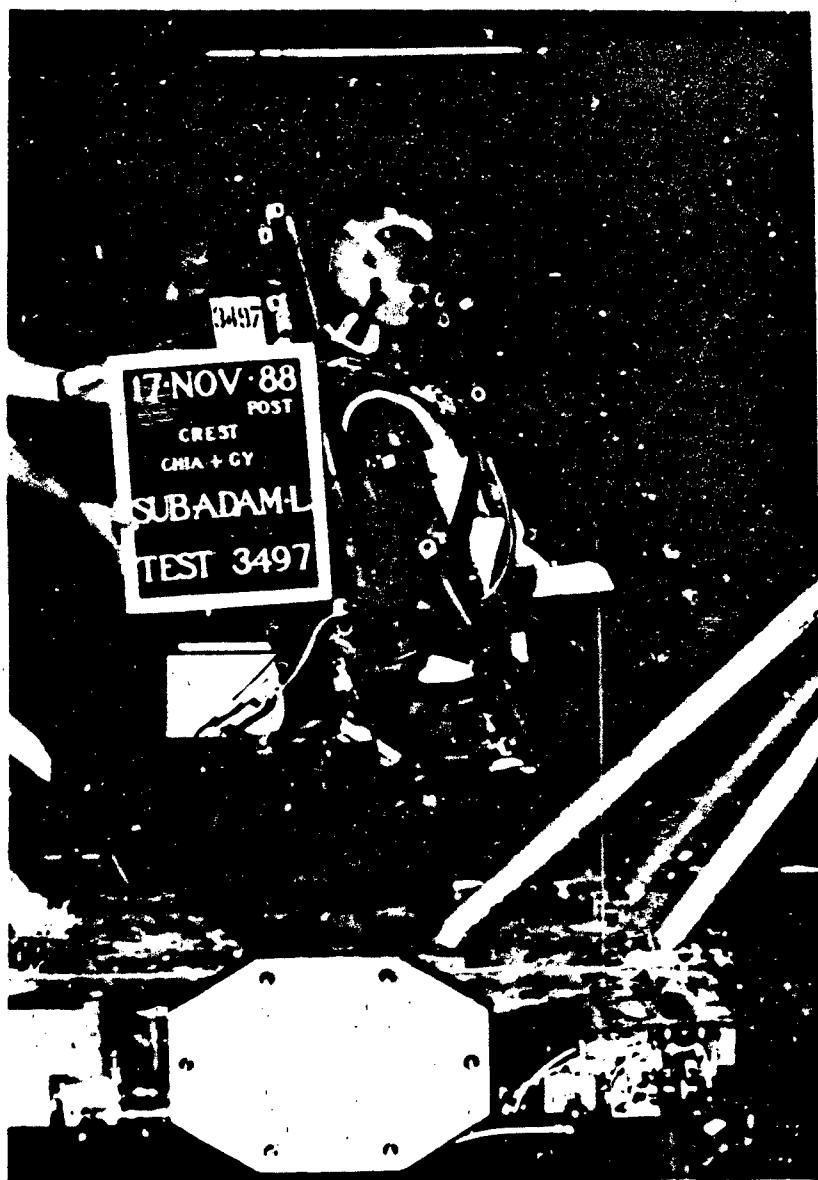


FIGURE 6: SLED SETUP FOR Gy TESTING

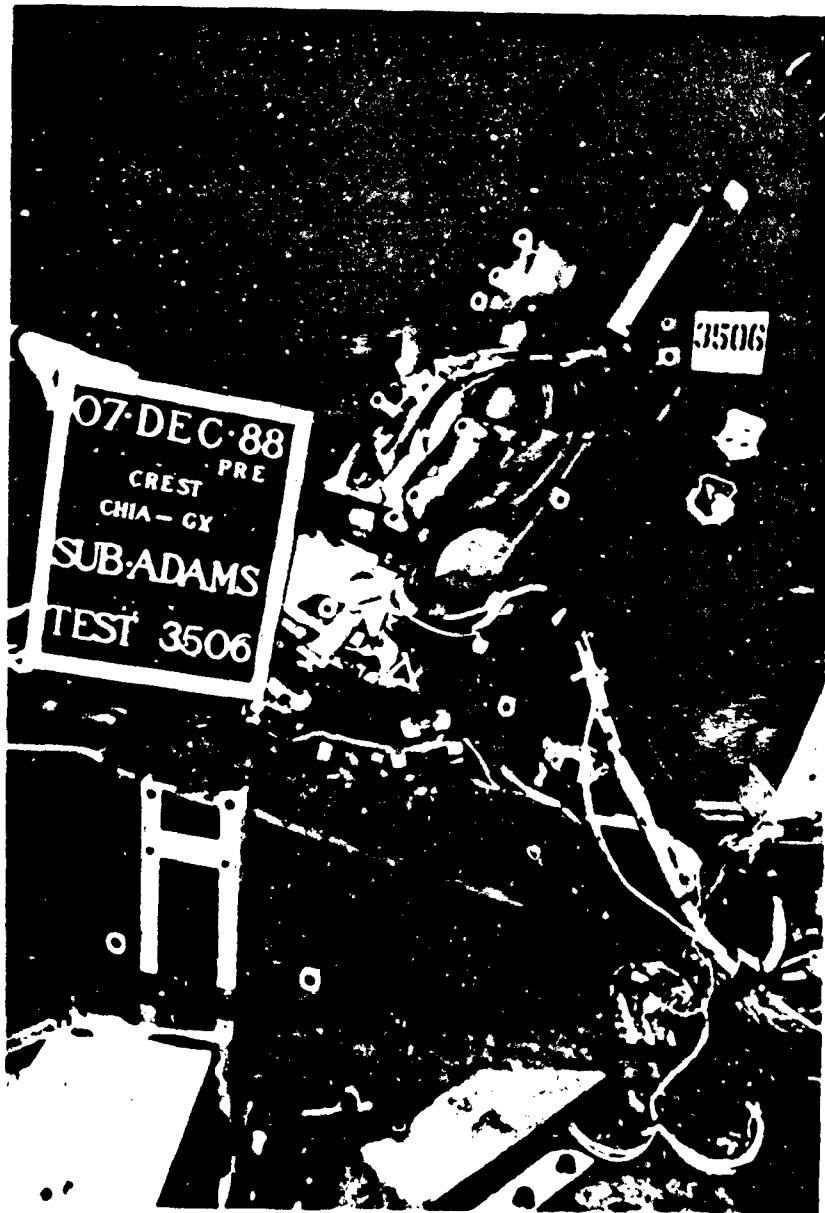


FIGURE 7: SMALL ADAM WITH EXTRA BACK CUSHION

The -10 Gx tests were intended to provide data for comparison with earlier human tests run at 10 G. This would allow evaluation of the ability of the ADAMs to simulate human response.

TABLE 1. TEST SEQUENCE

| TEST | CELL | ACCEL | HARNESS | ADAM | POST CAL | NOTES |
|-------|------|-------|---------|------|----------|----------------------|
| 3484 | A | +8Gy | X-45 | S | YES | ADAM Failure |
| 3485 | A | +8Gy | X-45 | L | YES | OK |
| 3486 | B | +11Gy | X-45 | L | NO | OK |
| 3487 | C | +14Gy | X-45 | L | YES | OK |
| 3488 | D | +6Gy | X-90 | L | NO | No-Test |
| 3489 | E | +11Gy | X-90 | L | NO | OK |
| 3490 | F | +14Gy | X-90 | L | YES | OK |
| 3491 | D | +8Gy | X-90 | S | NO | OK |
| 3492 | E | +11Gy | X-90 | S | NO | OK |
| 3493 | F | +14Gy | X-90 | S | YES | OK |
| 3494 | B | +11Gy | X-45 | S | NO | ADAM Failure |
| 3495 | B | +11Gy | X-45 | S | NO | OK |
| 3496 | C | +14Gy | X-45 | S | YES | OK |
| 3497* | D | +8Gy | X-90 | L | YES | OK |
| 3498 | G | -10Gx | X-90 | L | NO | OK |
| 3499 | H | -20Gx | X-90 | L | YES | ADAM Failure |
| 3500 | G | -10Gx | X-90 | S | NO | No-Test |
| 3501* | G | -10Gx | X-90 | S | NO | OK |
| 3502 | L | -10Gx | X-45 | S | YES | No-Test |
| 3503 | L | -10Gx | X-45 | L | YES | OK |
| 3504r | M | -20Gx | X-45 | L | NO | OK |
| 3505r | M | -20Gx | X-45 | L | YES | ADAM Failure |
| 3506r | M | -20Gx | X-45 | S | NO | OK |
| 3507r | M | -20Gx | X-45 | S | YES | OK |
| 3511 | N | -30Gx | X-45 | S | YES | OK |
| 3512 | N | -30Gx | X-45 | L | YES | OK |
| 3513 | O | -40Gx | X-45 | S | YES | OK |
| 3514 | P | -45Gx | X-45 | S | NO | No-Test |
| 3515 | H | -20Gx | X-90 | S | YES | OK |
| 3516 | H | -20Gx | X-90 | S | NO | No-Test |
| 3517r | I | -30Gx | X-90 | L | YES | OK |
| 3518r | I | -30Gx | X-90 | L | YES | ADAM Failure |
| 3519r | I | -30Gx | X-90 | S | YES | OK |
| 3520r | I | -30Gx | X-90 | S | YES | OK |
| 3521 | J | -40Gx | X-90 | L | YES | No-Test/ADAM Failure |
| 3523 | J | -40Gx | X-90 | S | YES | No-Test/ADAM Failure |
| 3524* | J | -40Gx | X-90 | S | YES | OK |
| 3525* | J | -40Gx | X-90 | L | YES | ADAM Failure |
| 3526 | K | -45Gx | X-90 | S | NO | ADAM Failure |
| 3527 | K | -45Gx | X-90 | L | NO | OK |

Tests 3508, 3509, 3510, 3522, and 3528 were camera proof tests

* Repeat of No-Test

r Repeatability Test

Failures 9/40

ADAM and Associated Equipment and Procedures

Each of the ADAMs contained the following sensors: tri-axial linear accelerometers mounted in the head and chest, six-component load cells mounted in the head/neck and pelvis, position sensors mounted in the torso and limbs, and an externally mounted tri-axial chest accelerometer. A temperature sensor was mounted on the hottest board inside ADAM, the Analog-to-Digital Conversion board (ADC). Signal amplification, filtering, digitization, and temporary storage of data were provided by the internal ADAM electronic instrumentation system. Power for the ADAM internal electronics and sensor excitation was provided by the ADAM Field Power Supply (FPS).

ADAM pre and post electrical checks were performed for each test by injecting voltages into the input of each channel's amplification system. The output voltage of the channel was displayed in hex units on a hand-held display terminal and referred to as the RCal value along with the resting output condition which was referred to as the NonRCal value. Significant variations in either the expected RCal or NonRCal values were indicative of defective channels. In addition, a program was run which automatically printed out the RCal and NonRCal values just before and after impact, along with the differences in hex of the pre-impact RCal-NonRCal values and the post-impact RCal-NonRCal values. Differences between these two sets of values indicated drift in channel sensitivity. Channels were to be recalibrated if this difference exceeded 6 bits or 0.04 volts.

Electronic Data Acquisition (ADACS, RAM and DECOM)

ADAM response data were collected over a period of four seconds by the ADAM data acquisition system and stored in the ADAM on-board memory (RAM). The ADAM data were also transmitted over its own line in a 250 foot whip cable via a decommutator (DECOM) and stored in the ADAM DRASS (Data Retrieval and Storage System). Following an ADAM test the data were downloaded from the DRASS to a Z-100 computer for temporary storage and then transferred to the VAX. The on-board RAM data were also downloaded into the DRASS, downloaded to the Z-100, and then transferred to the VAX. VAX software routines converted the data from binary format into engineering units and provided "quick look" plots of both RAM and DECOM channels.

Data were also collected via a non-ADAM system, the Automatic Data Acquisition and Control System (ADACS). Lines tapped at the ADAM transducers provided input to the ADACS. Signal filtering, amplification, and digitization took place on-board the sled. The ADACS data were transmitted to the computer room via the 250 foot whip cable and transferred to the VAX for comparison with the ADAM RAM and DECOM data. A list of the ADAM channel sensitivities was entered into the plotting routines in order to compensate for the different gains of the ADACS and the ADAM systems.

Photogrammetric System

Two 16mm motion picture cameras, operated at 500 frames/sec, were mounted on the sled to record the movement of the test manikin and to document any failures which might occur. For the +Gy tests, one camera provided a frontal view of the seated manikin and the other camera provided a front oblique view. For the -Gx tests, one camera provided a front oblique view

of the manikin and the other camera provided a side view. Each camera was synchronized with the electronic data by a pulse code and an electronic flash.

A video camera was also used to document the tests. This camera and the recorder used with it are capable of recording motion at a rate of 120 frames/sec with an effective shutter speed of 10 microseconds or less. Use of this system allowed the investigators to evaluate the response to impact immediately after each test. This system is described in Appendix A.

Data Processing

Data from each test were reduced in a standardized format. Reduced electronic data are available for review within Appendix B. Computer summaries provide relevant maxima and minima from the recorded ADACS signals. Relevant sums and times were also computed. The sums of the measured force are the maximum values of continuously summed measurements. Scaled plots of selected signals from ADACS, RAM, and DECOM were produced.

RESULTS

Test-by-Test Narrative (+Gy)

1. TEST 3484 Cell: A Subject: ADAM-S Result: ADAM Failure

ELECTRICAL: Noise was present in the Neck-Z Force channel prior to the test. Data initially could not be transferred from the ADAM to the DRASS due to a failure of the memory board in ADAM. ADAM did not receive the start signal, resulting in the loss of RAM data. The problem was attributed to a nicked wire which was shorting to the shielding. A large positive spike was present in the Z-Lumbar Force data (DECOM only) and a large negative spike was present in the Z-Lumbar Acceleration data. Excessive noise was present in the data on several channels (DECOM only). To prevent this problem from reoccurring in future tests, .01 uF capacitive filters were temporarily installed in the noisy small ADAM channel lines. The ADAM internal temperature data read 12° C lower than the ADACS temperature.

STRUCTURAL: Delamination of some zippers in the torso, arms, and legs was noticed before the test and delamination of a zipper in the pelvic area was observed after the test. A wire bundle in the right upper arm rotated. It was re-secured with tie-wraps after the test. Tears in the square corners of the skin in the armpit area and a puncture in the left upper wrist skin were noticed after the test. Two tears in the battery cover area of the skin in the back of ADAM were also noticed after the test.

PROCEDURAL: A change in the test plan called for the wrists to be placed left over right instead of tied together. The harness pre-tensions at the shoulders were lower than the 20 ± 5 lbs specified in the test plan, but were the maximum values which could be obtained.

2. TEST 3485 Cell: A Subject: ADAM-L Result: ADAM Success

ELECTRICAL: The Left Lower Leg Torque Positive data was defective due to a broken wire in the left knee load cell, and the Left Lower Leg Torque Negative data showed excessive noise. Large negative spikes were present in the data on four DECOM channels and one RAM channel. The ADAM internal temperature read 29.5° C lower than the ADACS temperature in this test and averaged about 28° lower in the remaining +Gx tests. This difference was decreased to about 8° in the +Gx tests by measuring the temperature voltage offset between the ADAM and the ADACS systems, and changing the offset value in the processing program.

STRUCTURAL: The skin and zipper in the area of the right armpit showed slight damage prior to the test. This was due to rubbing of the clevis against this area. Also, a zipper at the top of the torso was bent by the harness strap during the test.

The damaged soft-stop in the left upper arm medial/lateral joint was replaced prior to the test and the soft-stop in the shoulder (abduction/adduction in the coronal plane) joint was reglued after the test. A tie-wrap in the right upper arm was repaired after the test.

3. TEST 3486 Cell: B Subject: ADAM-L Result: ADAM Success

ELECTRICAL: Large negative spikes were present in the Y-Lumbar Force data (DECOM only).

STRUCTURAL: The zipper pull at the top of the torso was again bent by the harness during the test. The upper arm medial/lateral soft-stop was damaged after the test and was reglued. Extra tie-wrap was added to the upper arm wire bundle after the test. The right shoulder cover came off during this test and also during large ADAM tests 3487, 3489, and 3490.

4. TEST 3487 Cell: C Subject: ADAM-L Result: ADAM Success

ELECTRICAL: Excessive noise was present in the Z-Chest Acceleration data. Large negative spikes were present in the data on one RAM channel and 6 DECOM channels.

STRUCTURAL: A slight abrasion in the neck assembly was observed after the test. This appeared to be caused by harness pressure on the zipper. A cut in the right shoulder skin was noticed after the test and was repaired. Also, a small puncture and tears in the right upper arm skin were observed. Soft-stops in the wrist and elbow were reglued after the test.

5. TEST 3488 Cell: D Subject: ADAM-L Result: No-Test

ELECTRICAL: The pre-test electrical check indicated a defective Z-Head Acceleration channel, caused by a broken wire which had been pinched during reassembly. The wire was replaced and insulated before testing. Large negative spikes were present in the data on three channels (DECOM only). The ADACS Lumbar Y Force data showed an offset of about -64 lbs.

STRUCTURAL: The right side center edge of the zipper towards the top of the torso was taped prior to the test and was torn slightly from the skin during the test. Damage to the wire-wraps around the right and left forearm stops was discovered after the test.

PROCEDURAL: Some difficulty occurred in attempting to obtain the proper harness pre-tensions due to the straps having a tendency to slip into the openings between the thigh and hip. During processing of the data after the +Gy testing had been completed, it was noticed that the ADACS file had been accidentally deleted by DynCorp, making this a "No-Test". This test was later rerun as Test 3497.

6. TEST 3489 Cell: E Subject: ADAM-L Result: ADAM Success

ELECTRICAL: Excessive noise was present in the X, Y, and Z-Chest Acceleration data. Large negative spikes were present in the Y-Neck Moment data (RAM only).

STRUCTURAL: The zipper assembly in the right shoulder was torn during the test and had to be replaced. A small puncture in the left upper arm skin which was incurred in previous tests was repaired prior to the test. Damage was noticed after the test on the inside of the skin due to contact with the neck block. Three shoulder soft-stops became slightly unglued and were repaired after the test. Slight binding in the upper arm medial/lateral wiring was noticed after the test.

7. TEST 3490 Cell: F Subject: ADAM-L Result: ADAM Success

ELECTRICAL: A broken wire from the left hip to the telemetry port in the head was noticed after the test. However, the data in the left hip channels appeared to have been unaffected. Large negative spikes were present in the data on one RAM channel and 7 DECOM channels.

STRUCTURAL: A puncture in the inside skin on the right side of the torso was noticed after the test, caused by contact with the neck block.

8. TEST 3491 Cell: D Subject: ADAM-S Result: ADAM Success

ELECTRICAL: The Right Arm Coronal Abductor data was faulty due to a cold solder joint in the associated pot wiper. Excessive noise was present in the X-Lumbar Acceleration and Left Lower Leg Torque Negative data. Large negative spikes were present in the data on three channels (DECOM only). The ADACS internal temperature increased 15° C from the previous small ADAM test, while the ADAM temperature increased by only 1° C.

STRUCTURAL: Two tie-wraps in the left elbow were replaced after the test when a loose fit was noticed.

PROCEDURAL: The harness straps for both the hips and shoulders were unable to be adjusted to the required pre-tensions due to the small size of ADAM.

9. TEST 3492 Cell: E Subject: ADAM-S Result: ADAM Success

ELECTRICAL: Excessive noise was present in the Left Lower Leg Torque Negative data. A Large negative spike was present in the data on one RAM and one DECOM channel.

10. TEST 3493 Cell: F Subject: ADAM-S Result: ADAM Success

ELECTRICAL: Excessive noise was present in the the X-Lumbar Acceleration, Right Sternoclavicular Elevation/Depression,

and Left Lower Leg Torque Negative data. A dropout occurred in the Right Hip Flexion data due to an intermittent open. The post-test electrical check showed four channels in need of recalibration. This was to be accomplished prior to the next test. Line 3 of the A/D multiplexor was damaged and later replaced. This may have been causing the noise in Test 3484.

11. TEST 3494 Cell: B Subject: ADAM-S Result: ADAM Failure

ELECTRICAL: Both the RAM and DECOM data were lost due to a failure of the ADAM to DRASS data transfer. The problem was caused by a defective power supply in the digital I/O board. The defective board was replaced and the RAM data was retrieved, but none of the channels showed any response. The malfunction could therefore have occurred either before or during the test.

STRUCTURAL: Tie-downs and laced cables were replaced in the right shoulder prior to the test. Also prior to the test it was noticed that the Right shoulder elevation/depression lower rear soft-stop had to be reglued. This came loose again after the test due to improper gluing.

PROCEDURAL: Beginning with the next test, the final pre-test electrical checks were to be taken after ADAM was strapped into the seat and the harness pre-tension adjustments made. This was done to avoid some of the uncertainty regarding when any problem with the ADAM instrumentation might have occurred. This test was rerun as Test 3495.

12. TEST 3495 Cell: B Subject: ADAM-S Result: ADAM Success

ELECTRICAL: Excessive noise was present in the Y-Lumbar Moment and the Right Hip Abduction/Adduction data.

STRUCTURAL: Prior to the test, the wire hold down screw securing the left knee potentiometer had to be tightened, although the potentiometer itself remained fixed. A small puncture was observed after the test on the inside skin of the torso due to contact with the corner of the neck block.

13. TEST 3496 Cell: C Subject: ADAM-S Result: ADAM Success

ELECTRICAL: An ADAM serial communication link failure occurred during the pre-test electrical check, after ADAM was strapped into the seat. The problem was a loose connection at the CPU board interconnect. This connection may not have been properly tightened during previous ADAM maintenance. A dropout occurred in the Right Lower Leg Torque Positive data. Excessive noise was present in the Y-Lumbar Moment data. Large negative spikes were present in the data on two channels (DECOM only). The ADACS Lumbar Y Force data was saturated.

STRUCTURAL: Cuts on the inside skin of the lower right back were noticed after the test. These were caused by contact with the sharp corner of the viscera box. The zipper on the left side of the torso continued to pull apart.

14. TEST 3497

Cell: D (+8Gy) SUBJECT: ADAM-L Harness: X-90 Result: ADAM Success

ELECTRICAL: The post-test electrical check showed defective Left and Right Lower Leg Torque Negative channels, indicating a problem in the knee load celis. However, the data appeared normal for those channels. The calibration value of the X-Chest Acceleration channel changed by five hex units during the test.

PROCEDURAL: The harness pre-tensions at the hips were unable to be adjusted up to their required levels due to slippage of the straps into the openings between the thighs and hips.

Test-by-Test Narrative (-Gx)

1. Test 3498 Cell: G Subject: ADAM-L Result: ADAM Success

ELECTRICAL: The pre-test electrical check showed a defective Left Lower Leg Torque Negative channel (waived). A dropoff occurred in the Right Lower Torque Negative data, and excessive noise was present in both the Left and Right Lower Leg Torque Positive data. Broken wires were repaired in the left and right knee load cells after the test. Large negative spikes were present in the data on three channels (DECOM only). The ADAM internal temperature read 5° C lower than the ADACS temperature.

PROCEDURAL: Prior to the test, ADAM was loading down the start signal. The problem was discovered to be in the hand-held video terminal which had been left in the wrong mode after previous ADAM maintenance. Some position channels were inverted. It was discovered that the slope signs which are used to process the data for the position sensors were all made positive. This was corrected by changing them to the correct signs in the processing file. The harness pre-tensions at the hips were low.

2. TEST 3499 Cell: H Subject: ADAM-L Result: ADAM Failure

ELECTRICAL: A dropout occurred in the Head-Z Acceleration data. This was attributed to a wire which was strained during impact. A dropout also occurred in the Left Elbow Flexion and the Left Forearm Supination/Pronation data. A wire in the elbow was repaired after the test. The X-Chest acceleration data showed an unexpectedly large pulse. A loose wire was repaired which was possibly causing the problem.

STRUCTURAL: The ADAM arm zippers needed to be taped prior to the test to avoid separating.

PROCEDURAL: The ADACS temperature measured incorrectly at -258° C due to SRL forgetting to disconnect the ground jumper which was being used to obtain the temperature voltage offset. Thigh inserts were installed but harness pre-tensions at the hips were still low. Several other channels were further out of calibration than expected due to SRL revising some channel sensitivities.

3. TEST 3500 Cell: G Subject: ADAM-S Result: No-Test

ELECTRICAL: The pre-test electrical check showed a malfunction in the ADAM to DRASS data transfer. This was caused by a power supply failure on the digital I/O board. The board was replaced and a heat sink installed to prevent a recurrence. A dropout occurred in the Left Lower Leg Torque Negative data (waived for the next two tests). A large spike appeared in the data on several channels at about 250 ms. This was caused by ADAM's head striking the aluminum block above the back rest. The ADAM internal temperature read 18.4° C higher than the ADACS temperature.

STRUCTURAL: The teeth in the zippers on the right and left sides of the torso would not remain locked prior to the test. The Sternoclavicular Elevation/Depression left lower front soft-stop was repaired prior to the test.

PROCEDURAL: A "No-Test" occurred due to no photogrammetric data. This was caused by the switches at the camera station being set incorrectly. A seat cushion was placed in back of ADAM for the remainder of the tests in order to help achieve the desired harness pre-tensions. However, the hip pre-tensions were still low.

4. TEST 3501 Cell: G Subject: ADAM-S Result: ADAM Success

ELECTRICAL: The calibration of two channels changed by more than 6 hex units during the test. The large spike at 250 ms caused by ADAM striking his head was still present on several channels. The ADAM internal temperature read 14° C higher than the ADACS temperature.

STRUCTURAL: Damage, possibly from previous tests, was observed in the zipper assemblies after the test in the right and left ankle regions. Damage to the shoulder wire-wrap was also noticed after the test. The torque in the Left Forearm Supination/Pronation joint was binding due to a manufacturer's burr. This was noticed after the test. The right elbow potentiometer connector appeared to need remounting after the test.

PROCEDURAL: The harness pre-tensions at the hips and shoulders were low.

5. TEST 3502 Cell: L Subject: ADAM-S Result: No-Test

ELECTRICAL: Excessive noise was present in the the Right Sternoclavicular Elevation/Depression data. A dropoff occurred in the Right Lower Leg Torque Negative data. The ADAM internal temperature read 10° C higher than the ADACS temperature.

PROCEDURAL: A "No-Test" occurred due to no DECOM data. This was caused by the DRASS being incorrectly set in the download position. It was discovered by SRL that several of the position channels had been assigned incorrect slope signs. These were corrected in time for the next test. The harness pre-tensions at the shoulders were low.

6. TEST 3503 Cell: L Subject: ADAM-L Result: ADAM Success

ELECTRICAL: The Left Sternoclavicular Pronation/Retraction data was breaking up during the test due to a faulty potentiometer on the transducer board. A large negative spike was present in the X-Lumbar Moment data (DECOM only), and large positive spikes were present in the Lumbar Roll data (DECOM only). A spike occurred in the ADACS data on three channels. The ADACS system was checked after the test and no problem could be located.

STRUCTURAL: Prior to the test, it was discovered that the lockwasher and the indexed flat washer keys in the right shoulder lockwasher assembly were sheared off. The damage was due to the lash or "slop" in the lockwasher. The assembly was repaired and a thrust (or friction) bushing was added to prevent this problem from recurring. After the test, it was noticed that there were small cuts in both the left and right heel skins due to the foot rods puncturing the skin from the inside. This was caused by the impact of the feet striking the sled.

PROCEDURAL: The test was initially aborted when the track lights went out. No problem could be found in the lighting system and ADAM was rechecked and the test completed. The harness pre-tensions at the hips were low.

7. TEST 3504 Cell: M Subject: ADAM-L Results: ADAM Success

ELECTRICAL: A possible faulty response occurred in the Left Elbow Flexion data. A broken wire was discovered and repaired. A breakup was still occurring in the Left Sternoclavicular Pronation/Retraction data. A dropoff occurred in the Left Lower Leg Torque Positive data. This channel was waived for the remainder of the large ADAM tests. ADACS offsets occurred on four channels.

STRUCTURAL: After the test, it was noticed that the left shoulder shrug electrical connector was frayed. It was replaced before the next test. The sternoclavicular transducer board assembly was rebuilt after the test.

PROCEDURAL: The seat cushion was noticed to have slipped forward during the test. ADAM was lifted up and the cushion pushed back for the next test.

8. TEST 3505 Cell: M Subject: ADAM-L Result: ADAM Failure

ELECTRICAL: The X-Chest Acceleration data was faulty, caused by a loose wire located near the sensor.

STRUCTURAL: Damage was noticed after the test to the inner skin in the lower right corner of the back. A cut in the front left skin of the pelvis was also noticed, probably caused by the seat strap crushing the skin against the hip clevis.

PROCEDURAL: A short delay occurred prior to the test due to the charge on the DRASS battery being low. During the test, the seat cushion slid forward and had to be repositioned.

9. TEST 3506 Cell: M Subject: ADAM-S Result: ADAM Success

ELECTRICAL: Three of the Lower Leg Torque channels showed defective data (all three waived for next test). The X-Lumbar Acceleration channel calibration changed by five hex units during the test.

STRUCTURAL: Small cuts were noticed on the skin of the left and right heels after the test.

PROCEDURAL: The harness pre-tensions at the shoulders were low.

10. TEST 3507 Cell: M Subject: ADAM-S Result: ADAM Success

ELECTRICAL: Defective data was present on all four Lower Leg Torque channels. Three of these channels had been waived prior to the test. Excessive noise was present in the X-Lumbar Acceleration data. The ADAM internal temperature read 7.5° C higher than the ADACS temperature.

STRUCTURAL: The wires to the Lentiometer (abduction/adduction) were disconnected prior to the test to a lockwasher key in the Right shoulder. The wires were reconnected after the test.

PROCEDURAL: The harness pre-tensions at the shoulders were low.

11. TEST 3511 Cell: N Subject: ADAM Success

ELECTRICAL: Excessive noise was present in the X-Lumbar Moment data. This channel was waived and no defect was found. The Right X-Lumbar Acceleration data appeared to be caused by a bad connection to the X-Lumbar Acceleration sensor. Broke hex units during the test. Broke the connection of the X-Lumbar Acceleration sensor were

repaired to correct the problem. Broken wires on the Y-Neck Force accelerometer sensor were discovered prior to the test (waived). An unexpectedly large spike appeared in the Right Sternoclavicular Elevation/Depression data. This was checked after the test and no defect was found. The Right Lower Leg Torque Positive channel was repaired prior to the test. The Right and Left Lower Leg Torque Negative channels were waived for this test. Broken wires on the Right Knee Medial/Lateral position sensor were repaired. The ADAM internal temperature read 11° C higher than the ADACS temperature.

PROCEDURAL: SRL inadvertently failed to recalibrate the z-axis accelerometers for their maximum range before this test. This was then accomplished prior to the next small ADAM test. The harness pre-tensions at the shoulders were low.

12. TEST 3512 Cell: N Subject: ADAM-L Result: ADAM Success

ELECTRICAL: The Z-Chest Acceleration channel was found to be defective during an internal ADAM check prior to the test and was waived. A defective Crest Interface Board (CRIB) was determined to be the cause and was replaced prior to the next large ADAM test. The board replacement required the submission of new sensitivities for four ADAM channels. The shape of the response plot of the ADAM Z-Neck Force data was somewhat different than the corresponding ADACS data. Large negative spikes were present in the data (DECOM only) on two channels, and large positive spikes were present on one channel (DECOM only). The calibration of the Y-Lumbar Force and the Z-Lumbar Moment channels changed by five and four hex units, respectively, during the test. The magnitude of the ADACS internal temperature read excessively high due to a large spike in the data.

STRUCTURAL: After the test, it was noticed that the zipper on the left side of the torso was separating at the top. The torque in the left wrist flexion/extension joint had to be tightened due to arm lash in the test.

13. TEST 3513 Cell: O Subject: ADAM-S Result: ADAM Success

ELECTRICAL: Faulty test data was present on all Lower Leg Torque channels. Two of the defective channels were discovered prior to the test and were waived. The defective knee load cells were repaired after the test. Excessive noise was present in the Right Hip Abduction/Adduction data. The calibration of the X-Lumbar Acceleration channel changed by four hex units during the test. The ADAM internal temperature read 9° C higher than the ADACS internal temperature.

STRUCTURAL: Skin damage was noted after the test in two places, consisting of a small puncture hole near the left wrist and damage on the left upper leg internal skin. This damage

had occurred in previous tests. Skinned wires in the left shoulder complex and the left upper arm were taped after the test. The Left Shoulder Abduction/Adduction wire sleeve was skinned at the connector which mounted to the chest box. This was caused by a loose tie-down which resulted in scraping against the shoulder yoke as the arms rotated upward.

PROCEDURAL: The harness pre-tensions at the shoulders were low.

14. TEST 3514 Cell: P Subject: ADAM-S Result: No-Test

ELECTRICAL: The wiring to the knee load cells was broken during the test causing the data in three of the Lower Leg Torque channels to be defective. Apparently the wires had insufficient slack for the range of leg motion. The X-Neck Moment data was faulty due to a loose wire. Excessive noise was present in the Right Sternoclavicular Elevation/Depression and the Y-Lumbar Acceleration data. These were waived for the next two tests. The ADAM internal temperature read 7° C higher than the ADACS temperature.

STRUCTURAL: A zipper failure was noticed in the right upper leg prior to the test.

PROCEDURAL: A "No-Test" occurred due to a film break in the oblique LOCAM camera. The polarity of the ADAM data in the X-Head Acceleration channel was inverted from the previous small ADAM tests despite the sensitivity parameters being the same for both tests.

15. TEST 3515 Cell: H Subject: ADAM-S Result: ADAM Success

ELECTRICAL: Excessive noise was present in the Right Sternoclavicular Elevation/Depression (waived) and X-Lumbar Acceleration data. Also, some noise was present in the Left Lower Leg Torque Negative data. The calibration of the Y-Lumbar Moment channel changed by six hex units during the test. The ADAM internal temperature read 9° C higher than the ADACS temperature.

STRUCTURAL: The tie-wrap around the neck wires was pulled off during the test due to the motion of the head.

16. TEST 3516 Cell: H Subject: ADAM-S Result: No-Test

ELECTRICAL: Excessive noise was present in the Right Hip Abduction/Adduction data, and continued to be present for most of the remaining small ADAM tests. The shape of the response plot of the ADAM Y-Neck Moment data was somewhat different than for the corresponding ADACS data. The ADAM internal temperature read 8° C higher than the ADACS temperature. A "No-Test" occurred due to faulty ADACS Head/Neck Z Force data. The problem was caused by a shield to system ground short.

STRUCTURAL: The left shoulder cover came off during this and one other small ADAM test.

PROCEDURAL: The harness pre-tensions at the hips and shoulders were low.

17. TEST 3517 Cell: I Subject: ADAM-L Result: ADAM Success

ELECTRICAL: Prior to the test, the Left Lower Leg Torque Positive channel was determined to be faulty (waived). Large negative spikes were present in the data on one RAM and two DECOM channels, and large positive spikes were present on one DECOM channel. Excessive noise was present in the Z-Chest Acceleration data. The Y-Lumbar Moment data saturated at 3300 in-lbs during this test and continued to saturate at this same level during the remaining large ADAM tests. The cause appeared to be in the inability of the load cell transducer to measure forces more than 10% greater than its rated value of \pm 3000 lb-in. The ADAM internal temperature read 6° C higher than the ADACS temperature. The ADACS Head/Neck Z Force data showed an offset of -200 lbs and the shape of the response plot was somewhat different than the corresponding ADAM plot.

18. TEST 3518 Cell: I Subject: ADAM-L Result: ADAM Failure

ELECTRICAL: The Z-Neck Force data showed an excessively high peak magnitude. The problem appeared to be located near the sensor connection. Dropouts were present in the Right Sternoclavicular Pronation/Retraction data. The cause was a pinched wire which was repaired, insulated, and repositioned. A breakup and dropout occurred in the Left Elbow Flexion data. A board connector and short cable were replaced. The ADAM internal temperature read 9° C higher than the ADACS temperature.

PROCEDURAL: The harness pre-tensions at the hips were low.

19. TEST 3519 Cell: I Subject: ADAM-S Result: ADAM Success

ELECTRICAL: Excessive noise was present in the Right Sternoclavicular Elevation/Depression data. The ADAM internal temperature read 9° C higher than the ADACS temperature.

PROCEDURAL: The harness pre-tensions at the hips and shoulders were low.

20. TEST 3520 Cell: I Subject: ADAM-S Result: ADAM Success

ELECTRICAL: Excessive noise was present in the Y-Lumbar Moment data. The ADAM internal temperature read 6° C higher than the ADACS temperature. The ADACS Neck MY Torque data showed a -60 lb. offset.

STRUCTURAL: Damage to the shoulder viscera tie-down was noticed after the test. Damage occurred to the upper part of the

restraint harness. The harness was subsequently replaced after the test.

PROCEDURAL: The harness pre-tensions at the hips and shoulders were low.

21. TEST 3521 Cell: J Subject: ADAM-L Result: No-Test/
ADAM Failure

ELECTRICAL: The Z-Neck Force data was saturated due to a broken wire in the channel's negative excitation line. A dropout occurred in the Y-Head Acceleration data due to a bad wire. Excessive noise was present in the Y-Lumbar Acceleration data. The Left Lower Leg Torque Positive and Left Lower Leg Torque Negative data were faulty due to broken wires in the knee load cell. These channels were waived for the remainder of the large ADAM tests. An ADACS failure occurred due to a 70 ms data dropout occurring after impact, but the data was able to be processed up to the point of the dropout. The cause appeared to be broken connections in the whip cable. The ADACS internal temperature read excessively high at -253° C (See Test 3499).

STRUCTURAL: A left elbow bushing was loose prior to the test. This part was determined to have had a manufacturer's defect and was replaced. Damage was noticed at the top half of the X-Band 90 harness and at the lower half of the harness at the "D" ring. The harness was replaced after the test.

PROCEDURAL: A "No-Test" was declared due to a jam in the oblique LOCAM camera as well as the ADACS failure. The harness pre-tensions at the hips and shoulders were low.

22. TEST 3523 Cell: J Subject: ADAM-S Result: No-Test/
ADAM Failure

ELECTRICAL: The ADAM data was unusable due to a large spike occurring at about 60 ms. Also causing interference were 75 Hz sine and 100 Hz square waves which appeared in the data on some channels after the spike. A large spike was present in the ADACS Internal Temperature data making comparison with the ADAM temperature data difficult.

PROCEDURAL: A "No-Test" occurred due to a jam in the oblique LOCAM camera. The harness pre-tensions at the hips were low.

23. TEST 3524 Cell: J Subject: ADAM-S Result: ADAM Success

ELECTRICAL: The Right Lower Leg Torque Positive channel checked bad in the electrical pre-test (waived). The Lumbar Roll channel also checked bad in the electrical pre-test (waived). The problem appeared to be in a printed circuit connection which was resoldered after the test. A dropoff occurred in the Right Hip Flexion data (waived). The ADAM internal

temperature read 9° C higher than the ADACS temperature. A large positive spike was present in the data in several ADACS channels at about 230 ms.

STRUCTURAL: The right and left shoulder flexion assemblies were removed and inspected prior to the test.

PROCEDURAL: The LOCAM camera system was switched to the photosonic system for this test and beyond to avoid any future camera jams. The harness pre-tensions at the left hip and right shoulder were low.

24. TEST 3525 Cell: J Subject: ADAM-L Result: ADAM Failure

ELECTRICAL: The Z-Neck Force data was saturated. The cause was a defective head/neck z-axis load cell. The defective cell was replaced with the one from the small ADAM prior to the next large ADAM test. Excessive noise was present in the Y-Lumbar Acceleration data. A dropoff occurred in the Right Hip Flexion data. The load cell for the Y-Lumbar Moment channel was recalibrated prior to the test but the test data was still saturated at 3300 lb-in. The magnitude of the ADACS internal temperature data was excessively high at -255° C (see Test 3499).

PROCEDURAL: The RAM data needed to be reprocessed due to the failure of SRL to submit the new Y-Lumbar Moment sensitivities in time for the first processing. A camera ran out of film 1 second before the test, causing an abort. A harness tear was found after the test. The harness pre-tensions at the hips were low.

25. TEST 3526 Cell: K Subject: ADAM-S Result: ADAM Failure

ELECTRICAL: No DECOM data were available after the test. The cause was not determined. The Right Lower Leg Torque Negative and Left Lower Leg Torque Positive data appeared to be faulty. The Right Hip Flexion (waived) and Lumbar Roll data were defective. The cause was unknown. The ADAM internal temperature read 4° C higher than the ADACS temperature.

PROCEDURAL: The harness pre-tensions at the hips and shoulders were low.

26. TEST 3527 Cell: K Subject: ADAM-L Result: ADAM Success

ELECTRICAL: After the test it was noticed that the Lumbar Roll and Hip Flexion sensors had no positive excitation. The Right Hip Medial/Lateral position sensor had an intermittent wiring problem which was noticed after the test. The ADAM internal temperature read 11° C higher than the ADACS temperature.

STRUCTURAL: After the test it was noticed that two screws to the position sensor for the Right Sternoclavicular Elevation/Depression were loose, although the sensor itself remained

stationary. The sternoclavicular pronation/retraction potentiometer blade had some slight movement due to a lack of hot melt glue. This could have prevented the sensor from registering its full range.

PROCEDURAL: The ADAM data had to be reprocessed since the Z-Neck Force and Z-Neck Moment sensitivities changed due to replacement of the head/neck load cell. The harness pre-tensions at the hips and shoulders were low.

DISCUSSION

Structural Adequacy of ADAM

The ADAMs successfully completed the test program with no permanent deformation or failures of major structural components. Only one minor mechanical problem was noted during testing.

The clevis which allows the ADAM's arm to swing is fastened to the shoulder stud by means of a locknut, under which are a lockwasher and flat washer. There is some clearance between the sides of the stud keyway and the keys on the washers. Under the force of the tests, friction between the clevis and flatwasher causes the washers to rotate. The wear and impact deteriorated the keys until they failed.

This effect was noted prior to test 3503 for the large ADAM and after test 3507 for the small ADAM.

To solve the problem an OilliteTM (oil impregnated bronze alloy) bushing was placed between the shoulder clevis and the flat washer. This reduced the friction in the joint and no further problems were noted for the remainder of the test program.

Comparison of the Dynamic Response of ADAM With Human Subjects

No human response data are yet available to allow a comparison of ADAM and human response to +Gy impact, but a program to obtain the necessary data is planned for the future.

Human response data for 10 G impacts in the -x direction using prototype X-Band 90° and X-Band 45° harnesses in a CREST configuration are available and are summarized in Appendix C. These data were used to evaluate the ability of the ADAMs to simulate human dynamic response.

The following quantities measured during the tests were used to compare ADAM and human dynamic response:

1. Maximum x-axis chest acceleration (external accelerometers).
2. Time-to-peak x-axis chest acceleration (measured from initiation of impact).
3. Maximum z-axis chest acceleration (external accelerometer).
4. Time-to-peak for item 3.
5. Maximum x-axis head acceleration (internal sensor for ADAM, external for humans).
6. Time-to-peak for item 5.
7. Maximum combined shoulder anchor load.
8. Time-to-peak for item 7.
9. Maximum right horizontal anchor resultant load.
10. Time-to-peak for item 9.

Items 7 and 9 showed a fair correlation with subject weight. For these, a least squares line was drawn through the human data with 95% confidence bands. The ADAM data were then plotted on the same axes to allow a visual

determination of how well the ADAM data matched the human data. Figures 8 and 9 show this comparison for each of the two harness types. Maximum right vertical anchor load vs. subject weight is also plotted for completeness, though it cannot be used to judge the ADAM simulation of human response. This is because this anchor was pretensioned in the human tests but slack in the ADAM tests. The results are not comparable.

The other items showed a poor correlation with subject weight and were taken as independent of it. A Gaussian distribution was assumed instead. Mean (\bar{x}) and upper and lower confidence limits (± 2 standard deviation) were calculated for the human data and tabulated with the ADAM data for comparison.

TABLE 2. MAXIMUM X-AXIS CHEST ACCELERATION

| HUMAN | X-Band 90 | X-Band 45 |
|----------------|-----------|-----------|
| $\bar{x} + 2s$ | -9.9 G | -8.7 G |
| \bar{x} | -13.8 G | -14.7 G |
| $\bar{x} - 2s$ | -17.7 G | -20.7 G |
| Small ADAM | -11.6 G | -11.0 G |
| Large ADAM | -15.8 G | -11.3 G |

The ADAM results show a good fit with the human data.

TABLE 3. TIME-TO-PEAK X-AXIS CHEST ACCELERATION

| HUMAN | X-Band 90 | X-Band 45 |
|----------------|-----------|------------|
| $\bar{x} + 2s$ | 98.1 msec | 104.5 msec |
| \bar{x} | 86.4 msec | 86.4 msec |
| $\bar{x} - 2s$ | 74.6 msec | 68.3 msec |
| Small ADAM | 77.0 msec | 73.0 msec |
| Large ADAM | 84.0 msec | 94.0 msec |

The ADAM results show a good fit with the human data.

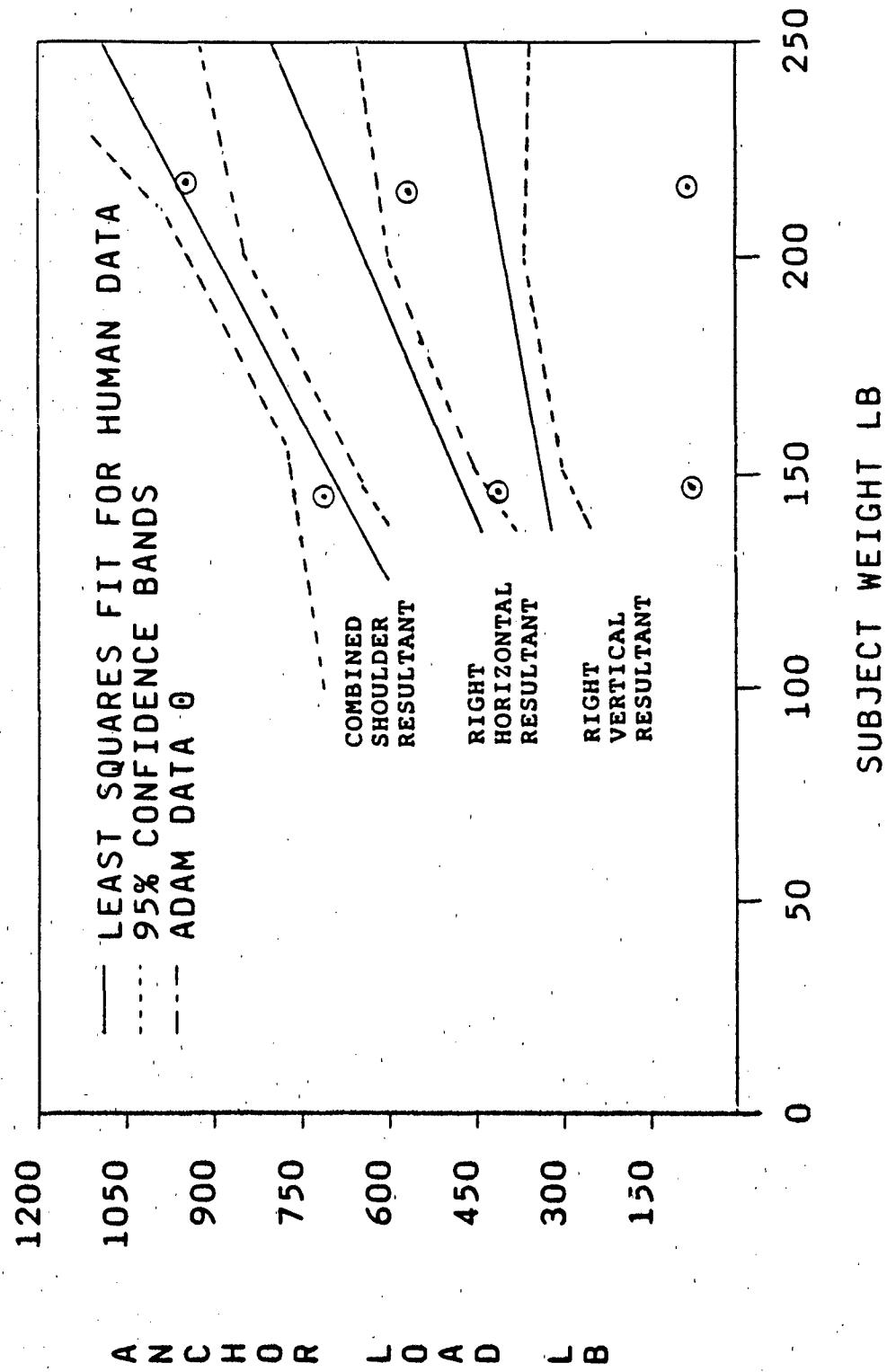


FIGURE 8: ANCHOR LOADS VERSUS SUBJECT WEIGHT
FOR HUMAN AND ADAM SUBJECTS
(X-BAND 90 HARNESS)

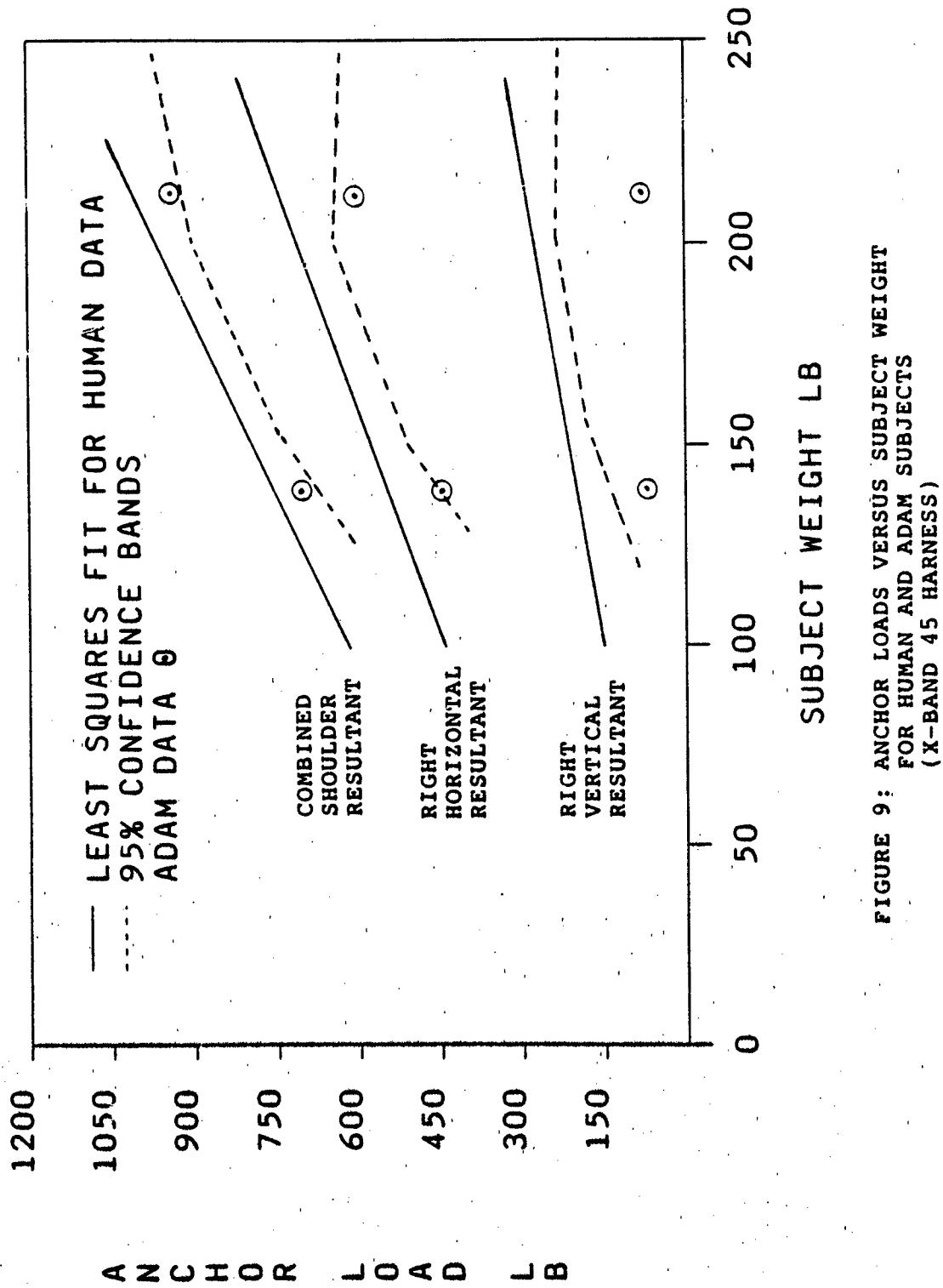


FIGURE 9: ANCHOR LOADS VERSUS SUBJECT WEIGHT
 FOR HUMAN AND ADAM SUBJECTS
 (X-BAND 45 HARNESS)

TABLE 4. MAXIMUM Z-AXIS CHEST ACCELERATION

| HUMAN | X-Band 90° | X-Band 45° |
|----------------|------------|------------|
| $\bar{X} + 2S$ | 16.5 G | 20.5 G |
| \bar{X} | 11.0 G | 13.1 G |
| $\bar{X} - 2S$ | 5.5 G | 5.7 G |
| Small ADAM | 12.2 G | 16.1 G |
| Large ADAM | 13.7 G | 12.6 G |

The ADAM results show a good fit with the human data.

TABLE 5. TIME-TO-PEAK Z-AXIS CHEST ACCELERATION

| HUMAN | X-Band 90° | X-Band 45° |
|----------------|------------|------------|
| $\bar{X} + 2S$ | 130.7 msec | 137.7 msec |
| \bar{X} | 93.6 msec | 99.3 msec |
| $\bar{X} - 2S$ | 56.5 msec | 60.9 msec |
| Small ADAM | 68.0 msec | 73.0 msec |
| Large ADAM | 85.0 msec | 84.0 msec |

The ADAM results show a good fit with the human data.

TABLE 6. MAXIMUM X-AXIS HEAD ACCELERATION

| HUMAN | X-Band 90° | X-Band 45° |
|----------------|------------|------------|
| $\bar{X} + 2S$ | -6.9 G | -7.3 G |
| \bar{X} | -10.2 G | -10.8 G |
| $\bar{X} - 2S$ | -13.4 G | -14.3 G |
| Small ADAM | -18.0 G | -18.2 G |
| Large ADAM | -16.1 G | -15.4 G |

The ADAMS, particularly the small ADAM, show a poor fit with the human data. The ADAM accelerometer is more rigidly mounted and may be located at a greater radius from the axis of rotation than the mouth-pack accelerometer used in the human tests. However, it is unlikely that these factors affect the results to a significant degree.

TABLE 7. TIME-TO-PEAK X-AXIS HEAD ACCELERATION

| HUMAN | X-Band 90° | X-Band 45° |
|----------------|------------|------------|
| $\bar{X} + 2S$ | 132.7 msec | 117.0 msec |
| \bar{X} | 106.6 msec | 96.4 msec |
| $\bar{X} - 2S$ | 80.5 msec | 75.8 msec |
| Small ADAM | 104.0 msec | 103.0 msec |
| Large ADAM | 105.0 msec | 102.0 msec |

The ADAM results show a good fit with the human data.

ITEM 7. MAXIMUM COMBINED SHOULDER ANCHOR LOAD

Figure 8 shows graphically that the ADAM data matches the human data very well for the X-Band 90° harness. The results are reasonable for the X-Band 45° harness.

TABLE 8. TIME-TO-PEAK FOR MAXIMUM COMBINED SHOULDER ANCHOR LOAD

| HUMAN | X-Band 90° | X-Band 45° |
|---------------------|------------|------------|
| $\bar{X} + 2S$ | 99.9 msec | 93.8 msec |
| \bar{X} | 94.3 msec | 88.2 msec |
| $\bar{X} - 2S$ | 88.7 msec | 82.6 msec |
| Small ADAM (x-axis) | 78.5 msec | 77.0 msec |
| Large ADAM (x-axis) | 91.5 msec | 86.0 msec |

The large ADAM shows a good fit with the human data. The small ADAM does not, probably because of the problem with getting adequate shoulder preloads with the small ADAM.

ITEM 9. MAXIMUM RIGHT HORIZONTAL ANCHOR RESULTANT LOAD

Figures 8 and 9 show that the ADAM data fit the human results poorly. The correlation coefficient for the X-Band 45° line is low, causing it to have larger confidence bands than that for the X-Band 90° harness.

TABLE 9. TIME-TO-PEAK HORIZONTAL ANCHOR RESULTANT LOAD

| HUMAN | X-Band 90° | X-Band 45° |
|----------------|------------|------------|
| $\bar{X} + 2S$ | 89.4 msec | 93.3 msec |
| \bar{X} | 83.1 msec | 86.9 msec |
| $\bar{X} - 2S$ | 76.8 msec | 80.5 msec |
| Small ADAM | 85.0 msec | 77.0 msec |
| Large ADAM | 95.0 msec | 87.0 msec |

The small ADAM shows a good fit with the human data for the X-Band 90° harness and a poor fit for the X-Band 45° harness. The reverse is true for the large ADAM. The large ADAM response in the X-Band 90° may be slowed by the tubes of the harness attachment pressing into its sides. In the X-Band 45° harness, the slack in the vertical anchor may have had a larger effect on the small ADAM than the large ADAM.

Though the head accelerations are too high and the hip anchor forces too low, overall the ADAM data match the human data well. Two cautionary notes are required. First, the conclusions are drawn from a single test of each ADAM with each harness, so it is unclear if the ADAM test results are representative of average response. Second, for those items which show a poor match between ADAM and human data, it is not clear how much of the difference in response is due to differences in the test setup rather than differences between ADAM and human response.

Accuracy of ADAM Instrumentation

DECOM/RAM

Wilcoxon Signed Rank tests were performed in order to compare the ADAM RAM and DECOM systems. These tests used differences between the paired data of the two systems to test for differences between the means. The variables tested were peak magnitude and time-to-peak for the nine "critical channels". No significant differences were found between any of the RAM and DECOM data in either the small or the large ADAM ($\alpha = 0.05$).

Small ADAM RAM

Small ADAM peak magnitude and time-to-peak offset-adjusted data are shown in tables 10-13 for both the RAM and ADACS systems. All data are $n=1$ unless the G-level is followed by (2), indicating the data is the mean for $n=2$. RAM data deviating more than $\pm 5\%$ from the ADACS data are followed by an asterisk, with the percentage of the data deviations summarized in Table 14. Only the RAM Head Y Acceleration, Head Z Acceleration, and Neck Y Force data (+Gy), and the Head X Acceleration and Neck X Force data (-Gx), demonstrated consistent accuracy in the peak magnitude measurements. The RAM time-to-peak data, however, was consistently close to the ADACS data on all 8 channels, with the exception of the Lumbar Y Force (+Gy).

CHANNEL (+Gy)

| | | | |
|----------------------|------------|------------|------------|
| HEAD Y ACCEL | 14.5/14.7 | 25.0/24.9 | 34.2/34.4 |
| HEAD Z ACCEL | 15.3/16.4* | 25.3/25.4 | 37.3/36.8 |
| CHEST Y ACCEL | 17.1/16.1* | 24.8/23.1* | 29.0/28.5 |
| LUMBAR Y ACCEL | 23.3/25.3* | 36.3/39.6* | 36.8/39.1* |
| NECK Y FORCE (-LB) | 117/174 | 189/195 | 246/256 |
| NECK Z FORCE (LB) | 161/181* | 368/389* | 491/474 |
| LUMBAR Y FORCE (-LB) | 1719/908* | 2177/1164* | 1652/944* |
| NECK MX TORQ (LB*IN) | 268/429* | 628/652 | 824/797 |

2015*

28/686*

| | | | |
|----------------------|------------|------------|------------|
| HEAD Y ACCEL | 14.5/14.7 | 25.0/24.9 | 34.2/34.4 |
| HEAD Z ACCEL | 15.3/16.4* | 25.3/25.4 | 37.3/36.8 |
| CHEST Y ACCEL | 17.1/16.1* | 24.8/23.1* | 29.0/28.5 |
| LUMBAR Y ACCEL (-LB) | 23.3/25.3* | 36.3/39.6* | 36.8/39.1* |
| NECK Y FORCE (MS) | 39/132* | 129/128 | 120/119 |
| NECK Z FORCE (MS) | 127/124 | 124/127 | 118/116 |
| LUMBAR Y FORCE (MS) | 125/126 | 119/118 | 71/72 |
| LUMBAR Y FORCE (-MS) | 64/65 | 52/39* | 61/68* |
| NECK MX TORQ (MS) | 144/150 | 127/129 | 116/116 |

*RAM data deviating more than $\pm 5\%$ from ADACS data

TABLE 11
SMALL ADAM ADACS/RAM +Gy DATA
X-BAND 90° HARNESS

| CHANNEL (+Gy) | 8G | 11G | 14G |
|----------------------|------------|------------|------------|
| HEAD Y ACCEL (G) | 14.5/14.7 | 25.0/24.9 | 34.2/34.4 |
| HEAD Z ACCEL (-G) | 15.3/16.4* | 25.3/25.4 | 37.3/36.8 |
| CHEST Y ACCEL (G) | 17.1/16.1* | 24.8/23.1* | 29.0/28.5 |
| LUMBAR Y ACCEL (G) | 23.3/25.3* | 36.3/39.6* | 36.8/39.1* |
| NECK Y FORCE (-LB) | 117/174 | 189/195 | 246/256 |
| NECK Z FORCE (LB) | 161/181* | 368/389* | 491/474 |
| LUMBAR Y FORCE (-LB) | 1719/908* | 2177/1164* | 1652/944* |
| NECK MX TORQ (LB*IN) | 268/429* | 628/652 | 824/797 |

| | | | |
|---------------------|---------|----------|---------|
| HEAD Y ACCEL (MS) | 129/135 | 125/126 | 118/119 |
| HEAD Z ACCEL (MS) | 92/95 | 90/91 | 89/91 |
| CHEST Y ACCEL (MS) | 79/79 | 78/79 | 71/73 |
| LUMBAR Y ACCEL (MS) | 73/76 | 60/61 | 53/55 |
| NECK Y FORCE (MS) | 130/133 | 125/126 | 115/116 |
| NECK Z FORCE (MS) | 93/94 | 123/111* | 116/116 |
| LUMBAR Y FORCE (MS) | 69/72 | 59/60 | 49/51 |
| NECK MX TORQ (MS) | 136/135 | 128/121* | 115/118 |

*RAM data deviating more than $\pm 5\%$ from ADACS data

TABLE 12
SMALL ADAM ADACS/RAM -Gx DATA
X-BAND 45° HARNESS

| CHANNEL (-Gx) | 10G | 20G (2) | 30G | 40G |
|----------------------|------------|-----------|------------|------------|
| HEAD X ACCEL (-G) | 18.8/18.4 | 45.5/46.2 | 62.4/61.9 | 93.0/94.2 |
| HEAD Z ACCEL (-G) | 8.8/8.1* | 24.0/24.5 | 47.5/51.0* | 72.9/74.7 |
| CHEST X ACCEL (-G) | 15.1/15.5 | 29.6/30.6 | 50.0/60.3* | 61.8/60.3 |
| LUMBAR X ACCEL (-G) | 13.6/13.8 | 36.9/38.5 | 55.5/61.7* | 74.7/84.4* |
| NECK X FORCE (LB) | 164/157 | 411/398 | 562/559 | 866/833 |
| NECK Z FORCE (LB) | 54.5/63.1* | 188/207* | 403/450* | 622/660* |
| LUMBAR X FORCE (-LB) | 72.6/147* | 249/227* | 586/559 | 1127/1119 |
| NECK MY TORQ (LB*IN) | 147/139* | 381/358* | 703/616* | 834/808 |
| HEAD X ACCEL (MS) | 103/104 | 84/85 | 72/74 | 66/68 |
| HEAD Z ACCEL (MS) | 84/81 | 71/73 | 74/75 | 55/57 |
| CHEST X ACCEL (MS) | 68/69 | 54/56 | 46/46 | 41/42 |
| LUMBAR X ACCEL (MS) | 72/73 | 58/59 | 46/47 | 40/42 |
| NECK X FORCE (MS) | 104/102 | 83/83 | 72/72 | 65/68 |
| NECK Z FORCE (MS) | 253/87* | 94/96 | 76/76 | 67/73* |
| LUMBAR X FORCE (MS) | 93/90 | 80/78 | 71/70 | 63/66 |
| NECK MY TORQ (MS) | 95/95 | 77/77 | 65/65 | 60/62 |

*RAM data deviating more than $\pm 5\%$ from ADACS data

Table 15 shows the results of Wilcoxon Signed Rank tests comparing the small ADAM RAM and ADACS data, with levels of statistical significance in parentheses. Significant differences between 5% and 10% were present between the RAM and ADACS in the peak magnitude of the Lumbar Y Acceleration and Neck Y Force data (+Gy), and in the Chest X and Lumbar X Acceleration data (-Gx). The peak magnitude of the Lumbar Y Force data (+Gy) showed a large difference between the two systems (-45%), although not enough data were present to infer statistical significance. In the time-to-peak measurements, only the RAM Neck Z Force data (-Gx) deviated more than 5% from the ADACS data.

Graphical comparisons of small ADAM RAM and ADACS peak magnitude mean data as a function of carriage (sled) acceleration level are shown in Figures 10 and 11. The data were obtained by averaging measurements from the X-Band 45° and X-Band 90° harness tests. Large deviations between the two systems can be observed in the Lumbar Y Acceleration, Neck Y Force, Lumbar Y Force, and Neck MX Torque +Gy plots. The -Gx RAM curves, however, appear to match the ADACS curves fairly well for all eight channels, with the exception of the Chest X Acceleration and Lumbar X Acceleration data at 45 G.

The general shape of the small ADAM dynamic response plots in both the +Gy and -Gx tests appeared to match the shape of the corresponding ADACS plots closely. Most of the significant differences between the ADAM and ADACS peak magnitude listed in tables 10-13 occurred during tests where a relatively fast rise or fall time was present in the dynamic response. One possible explanation for the differences is in the different types of filtering in the two systems. The ADACS system consists of a low-pass four-pole 120 Hz Butterworth filter while both ADAMs employ low-pass eight-pole 200 Hz Butterworth filters. Another possible reason for the differences is that while the two systems both sampled data at 1000

samples/sec on all channels, the sampling time was not fully synchronized between the two systems. Also, the resolution of the ADAM A/D conversion employed only 8 bits as compared to 11 bits for the ADACS system. The significant differences in the time-to-peak data, however, did not appear to be due to any differences between the two systems in measuring time-to-peak, but usually resulted when slight variations between the response plot shapes as discussed above, caused the two systems to read different peaks as maximum.

TABLE 13
SMALL ADAM ADACS/RAM -Gx DATA
X-BAND 90° HARNESS

| CHANNEL (-Gx) | 10G (2) | 20G (2) | 30G (2) |
|----------------------|------------|------------|-----------|
| HEAD X ACCEL (-G) | 18.8/19.4 | 41.7/40.9 | 75.5/75.7 |
| HEAD Z ACCEL (-G) | 8.3/10.6* | 25.4/25.4 | 51.2/51.9 |
| CHEST X ACCEL (-G) | 13.3/14.3* | 29.8/30.1 | 40.7/40.7 |
| LUMBAR X ACCEL (-G) | 14.7/15.3 | 39.5/40.6 | 57.4/58.5 |
| NECK X FORCE (LB) | 160/174* | 370/355 | 711/696 |
| NECK Z FORCE (LB) | — | 164/170 | 448/418* |
| LUMBAR X FORCE (-LB) | 69.0/76.7* | 445/463 | 1015/967 |
| NECK MY TORQ (LB*IN) | 145/123* | 147/139* | 344/336 |
| | | | |
| HEAD X ACCEL (MS) | 104/105 | 84/85 | 75/76 |
| HEAD Z ACCEL (MS) | 157/240* | 82/83 | 61/62 |
| CHEST X ACCEL (MS) | 71/71 | 54/54 | 46/48 |
| LUMBAR X ACCEL (MS) | 78/79 | 57/58 | 50/51 |
| NECK X FORCE (MS) | 104/103 | 84/86 | 75/76 |
| NECK Z FORCE (MS) | — | 98/99 | 81/82 |
| LUMBAR X FORCE (MS) | 94/89* | 85/84 | 77/78 |
| NECK MY TORQ (MS) | 96/97 | 89/90 | 71/71 |
| | | | |
| CHANNEL (-Gx) | 40G | 45G | |
| HEAD X ACCEL (-G) | 82.2/83.7 | 120/122 | |
| HEAD Z ACCEL (-G) | 64.9/62.2 | 96.0/85.6* | |
| CHEST X ACCEL (-G) | 50.4/51.1 | 67.7/92.2* | |
| LUMBAR X ACCEL (-G) | 73.2/76.3 | 87.8/97.4* | |
| NECK X FORCE (LB) | 790/771 | 1141/1136 | |
| NECK Z FORCE (LB) | 609/597 | 953/937 | |
| LUMBAR X FORCE (-LB) | 435/399 | 2191/2147 | |
| NECK MY TORQ (LB*IN) | 388/370 | 722/785* | |
| | | | |
| HEAD X ACCEL (MS) | 71/72 | 65/66 | |
| HEAD Z ACCEL (MS) | 58/58 | 54/55 | |
| CHEST X ACCEL (MS) | 76/76 | 41/42 | |
| LUMBAR X ACCEL (MS) | 46/48 | 40/42 | |
| NECK X FORCE (MS) | 71/72 | 65/66 | |
| NECK Z FORCE (MS) | 76/78 | 68/69 | |
| LUMBAR X FORCE (MS) | 73/70 | 67/69 | |
| NECK MY TORQ (MS) | 67/68 | 62/63 | |

*RAM data deviating more than $\pm 5\%$ from ADACS data

TABLE 14
PERCENT SMALL ADAM RAM DATA
WITHIN 5% OF ADACS DATA

| CHANNEL (+Gy) | PEAK MAG | TIME-TO-PEAK |
|----------------|----------|--------------|
| HEAD Y ACCEL | 100% | 100% |
| HEAD Z ACCEL | 83% | 100% |
| CHEST Y ACCEL | 50% | 100% |
| LUMBAR Y ACCEL | 0% | 100% |
| NECK Y FORCE | 100% | 83% |
| NECK Z FORCE | 50% | 83% |
| LUMBAR Y FORCE | 17% | 67% |
| NECK MX TORQUE | 67% | 83% |

| CHANNEL (-Gx) |
|----------------|
| HEAD X ACCEL |
| HEAD Z ACCEL |
| CHEST X ACCEL |
| LUMBAR X ACCEL |
| NECK X FORCE |
| NECK Z FORCE |
| LUMBAR X FORCE |
| NECK MY TORQUE |

TABLE 15
WILCOXON SIGNED RANK TEST SUMMARIES FOR
SMALL ADAM RAM VS. ADACS DATA

| CHANNEL (+Gy) | PEAK MAG | TIME-TO-PEAK |
|----------------|-------------|--------------|
| HEAD Y ACCEL | -0.4% (NSD) | +1.6% (.10) |
| HEAD Z ACCEL | +1.1% (NSD) | +2.0% (.10) |
| CHEST Y ACCEL | -2.8% (NSD) | +1.9% (NSD) |
| LUMBAR Y ACCEL | +9.5% (.10) | +2.6% (.10) |
| NECK Y FORCE | +9.5% (.10) | 0.0% (NSD) |
| NECK Z FORCE | -0.6% (NSD) | -1.7% — |
| LUMBAR Y FORCE | -45.4% — | -1.8% — |
| NECK MX TORQUE | +3.1% (NSD) | +0.0% — |

| CHANNEL (-Gx) |
|----------------|
| HEAD X ACCEL |
| HEAD Z ACCEL |
| CHEST X ACCEL |
| LUMBAR X ACCEL |
| NECK X FORCE |
| NECK Z FORCE |
| LUMBAR X FORCE |
| NECK MY TORQUE |

Large ADAM RAM

Large ADAM peak magnitude and time-to-peak data are shown in tables 16-19 for both the RAM and ADACS systems, with the percentage of RAM data within

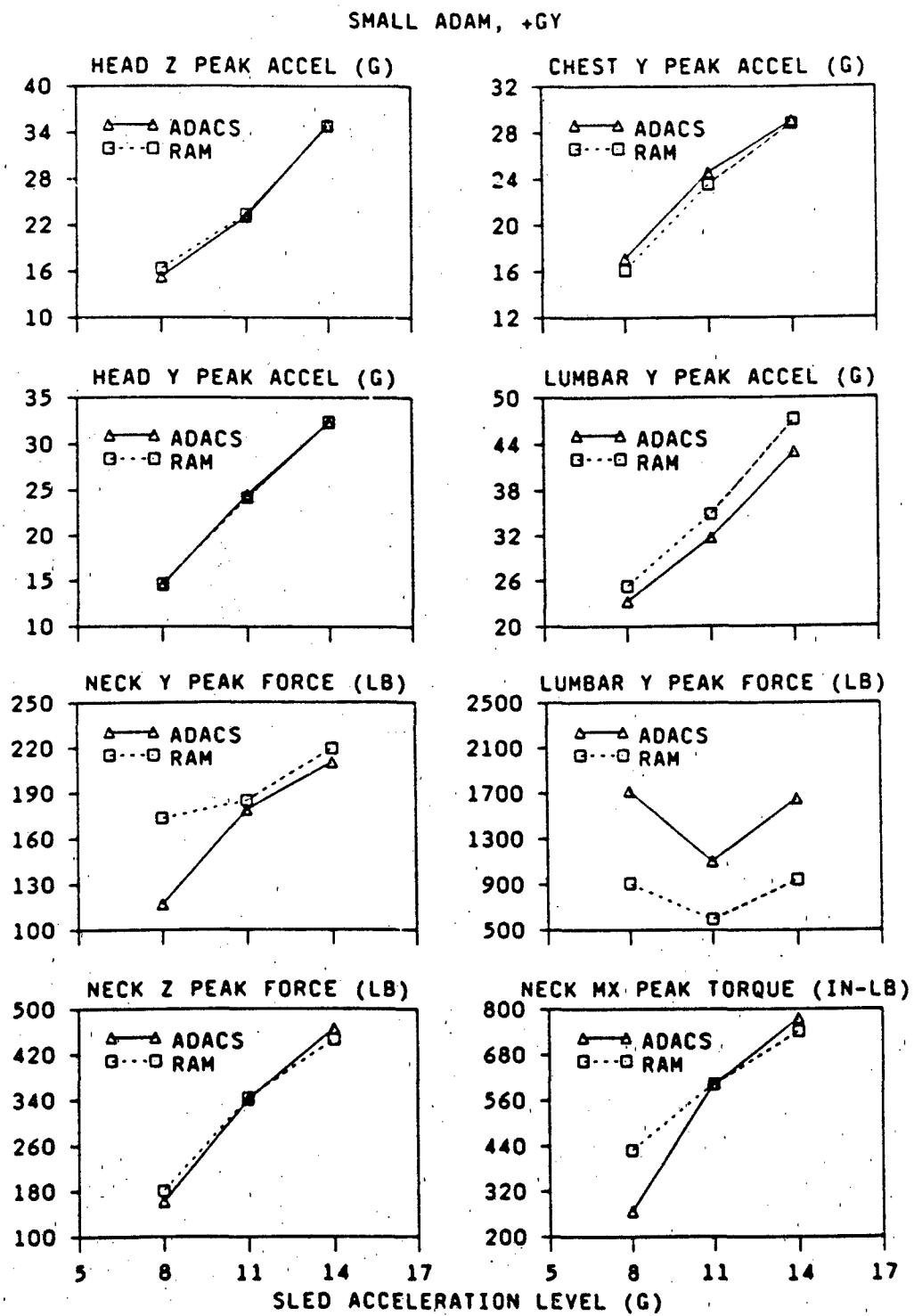


FIGURE 10. SMALL ADAM +GY DYNAMIC RESPONSES VS. CARRIAGE ACCELERATION

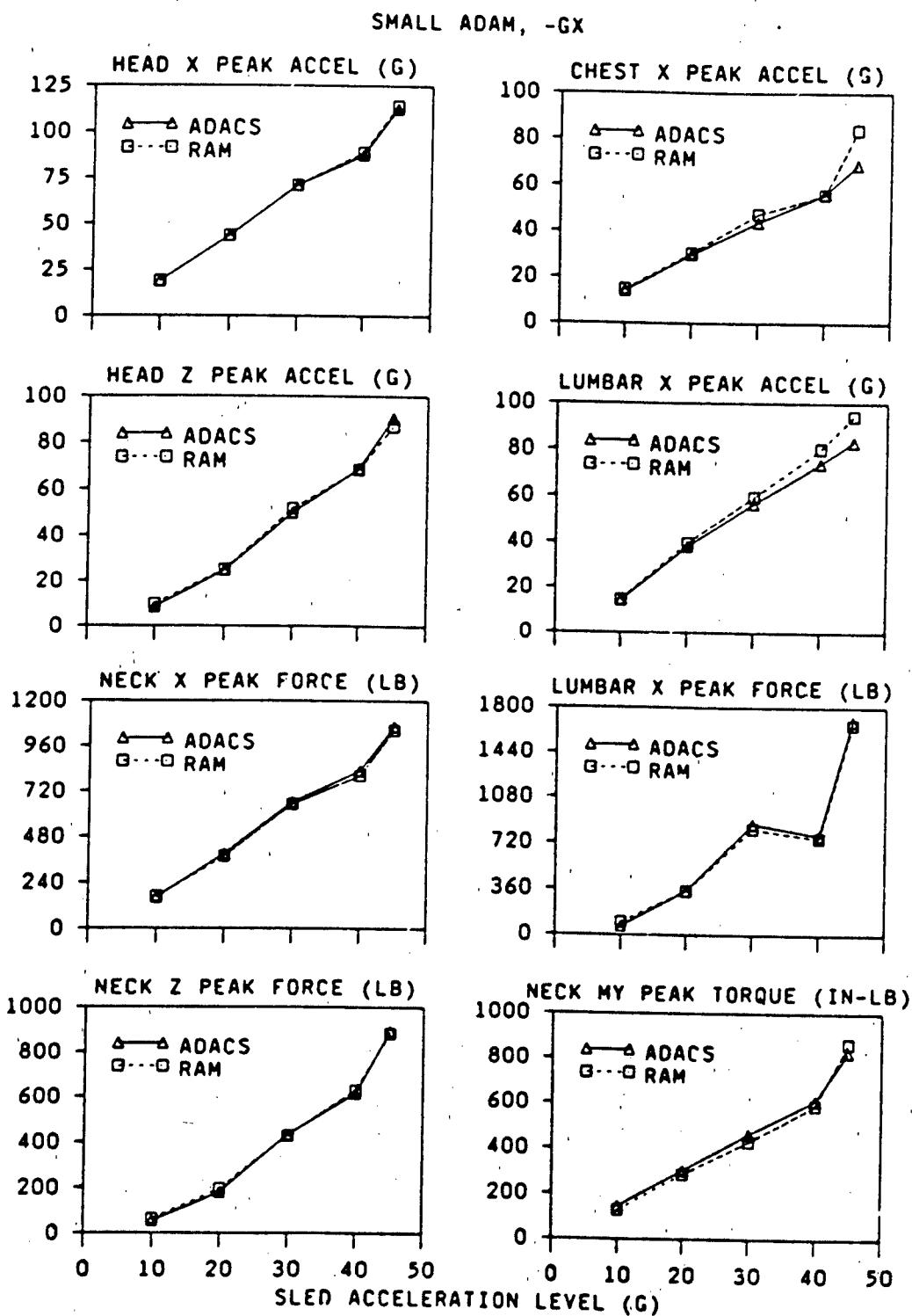


FIGURE 11. SMALL ADAM -GX DYNAMIC RESPONSES VS. CARRIAGE ACCELERATION

5% of the ADACS data summarized in Table 20. The RAM system was consistently accurate in measuring the +Gy peak magnitude data in all 8 channels with the exception of the Lumbar Y Force. The RAM peak magnitude data in the -Gx tests, however, were consistently close to the ADACS data in only the Head X Acceleration, Lumbar X Force, and Neck X Force channels. The Neck Z Force data was particularly inaccurate, with none of the measured RAM data occurring within 5% of the ADACS data. As in the small ADAM, the large ADAM RAM time-to-peak data were fairly close to the corresponding ADACS data in all channels, with the exception of the Lumbar Y Force (+Gy) and the Neck Z Force (-Gx).

Table 21 shows the results of Wilcoxon Signed Rank tests comparing the mean of the large ADAM RAM and ADACS data, with levels of statistical significance in parentheses. No significant differences greater than 5% were present between the RAM and ADACS in any of the +Gy data. Significant differences between 5% and 10%, however, were present in the -Gx peak magnitude of the Chest X Acceleration, Lumbar X Acceleration, and Neck MY Torque data. In the time-to-peak measurements, no RAM data deviated more than 5% from the corresponding ADACS data.

Graphical comparisons of large ADAM RAM and ADACS peak magnitude mean data as a function of carriage (sled) acceleration level are shown in Figures 12 and 13. The RAM data curves appear to fit the ADACS curves fairly closely for both the +Gy and the -Gx data in all 8 channels, with the exception of the Lumbar Y Force (+Gy), Chest X Acceleration (-Gx), and Lumbar X Acceleration (-Gx) curves, which all tend to show somewhat larger RAM values at the higher G-levels.

As was the case with the small ADAM, the general shapes of the large ADAM response plots in both the +Gy and -Gx tests appear to closely match the ADACS. Also, the significant differences between the ADAM and ADACS peak magnitude and time-to-peak listed in tables 16-19 usually occurred during tests where a fast rise or fall time was present in the response data.

TABLE 16
LARGE ADAM ADACS/RAM +Gy DATA
X-BAND 45° HARNESS

| CHANNEL (+Gy) | 8G | 11G | 14G |
|----------------------|------------|-----------|-----------|
| HEAD Y ACCEL (G) | 16.0/15.7 | 22.8/22.3 | 27.6/28.1 |
| HEAD Z ACCEL (-G) | 20.0/19.8 | 34.4/33.3 | 49.4/49.1 |
| CHEST Y ACCEL (G) | 18.5/18.9 | 26.2/26.4 | 29.7/29.3 |
| LUMBAR Y ACCEL (G) | 22.4/22.2 | 34.7/35.3 | 45.1/44.9 |
| NECK Y FORCE (-LB) | 176/172 | 255/239* | 335/344 |
| NECK Z FORCE (LB) | 200/193 | 361/366 | 522/519 |
| LUMBAR Y FORCE (-LB) | 84.8/90.5* | 169/162 | 320/349* |
| NECK MX TORQ (LB*IN) | 562/569 | 773/750 | 973/956 |
| | | | |
| HEAD Y ACCEL (MS) | 127/128 | 127/127 | 117/120 |
| HEAD Z ACCEL (MS) | 105/106 | 99/100 | 91/92 |
| CHEST Y ACCEL (MS) | 97/101 | 89/91 | 80/79 |
| LUMBAR Y ACCEL (MS) | 77/78 | 72/72* | 63/64 |
| NECK Y FORCE (MS) | 130/122* | 123/119 | 116/118 |
| NECK Z FORCE (MS) | 105/103 | 100/99 | 92/92 |
| LUMBAR Y FORCE (MS) | 69/64* | 66/64 | 59/61 |
| NECK MX TORQ (MS) | 125/127 | 117/117 | 120/121 |

*RAM data deviating more than \pm 5% from ADACS data

TABLE 17
LARGE ADAM ADACS/RAM +Gy DATA
X-BAND 90° HARNESS

| CHANNEL (+Gy) | 8G | 11G | 14G |
|----------------------|-----------|-----------|-----------|
| HEAD Y ACCEL (G) | 17.4/17.5 | 21.1/21.1 | 24.1/24.3 |
| HEAD Z ACCEL (-G) | 23.5/22.9 | 36.0/36.0 | 40.4/39.3 |
| CHEST Y ACCEL (G) | 17.6/17.5 | 27.3/27.3 | 28.4/28.3 |
| LUMBAR Y ACCEL (G) | 17.9/18.1 | 22.9/22.6 | 36.1/36.6 |
| NECK Y FORCE (-LB) | 186/193 | 253/257 | 285/278 |
| NECK Z FORCE (LB) | 242/246 | 343/334 | 404/423 |
| LUMBAR Y FORCE (-LB) | 261/266 | 529/523 | 373/392* |
| NECK MX TORQ (LB*IN) | 588/595 | 721/725 | 800/801 |
| HEAD Y ACCEL (MS) | 139/141 | 122/122 | 118/119 |
| HEAD Z ACCEL (MS) | 105/105 | 97/98 | 91/92 |
| CHEST Y ACCEL (MS) | 85/86 | 78/79 | 79/78 |
| LUMBAR Y ACCEL (MS) | 76/77 | 63/65 | 61/62 |
| NECK Y FORCE (MS) | 131/127 | 120/121 | 116/115 |
| NECK Z FORCE (MS) | 106/105 | 96/95 | 91/91 |
| LUMBAR Y FORCE (MS) | 72/70 | 67/61* | 59/60 |
| NECK MX TORQ (MS) | 136/138 | 125/126 | 113/114 |

*RAM data deviating more than \pm 5% from ADACS data

TABLE 18
LARGE ADAM ADACS/RAM -Gx DATA
X-BAND 45° HARNESS

| CHANNEL (-Gx) | 10G | 20G | 30G |
|----------------------|------------|------------|------------|
| HEAD X ACCEL (-G) | 15.7/15.9 | 45.4/45.5 | 72.8/74.6 |
| HEAD Z ACCEL (-G) | 4.5/4.6 | 30.8/31.3 | 59.3/62.6* |
| CHEST X ACCEL (-G) | 12.8/13.4 | 36.0/38.0* | 42.9/44.6 |
| LUMBAR X ACCEL (-G) | 13.5/13.9 | 27.9/27.5 | 61.8/66.9* |
| NECK X FORCE (LB) | 153/154 | 460/434* | 697/697 |
| NECK Z FORCE (LE) | 55.7/63.7* | 254/178* | 385/424* |
| LUMBAR X FORCE (-LB) | 193/187 | 932/910 | 1485/1445 |
| NECK MY TORQ (LB*IN) | 234/225 | 449/565* | 824/829 |
| HEAD X ACCEL (MS) | 102/106 | 88/88 | 78/80 |
| HEAD Z ACCEL (MS) | 96/99 | 70/71 | 64/66 |
| CHEST X ACCEL (MS) | 80/77 | 69/70 | 50/65* |
| LUMBAR X ACCEL (MS) | 78/80 | 75/58* | 49/51 |
| NECK X FORCE (MS) | 102/105 | 87/88 | 77/80 |
| NECK Z FORCE (MS) | 241/237 | 70/101* | 87/66* |
| LUMBAR X FORCE (MS) | 104/104 | 85/86 | 76/76 |
| NECK MY TORQ (MS) | 95/96 | 82/85 | 72/73 |

*RAM data deviating more than \pm 5% from ADACS data

TABLE 19
LARGE ADAM ADACS/RAM -Gx DATA
X-BAND 90° HARNESS

| CHANNEL (-Gx) | 10G | 20G | 30G (2) |
|----------------------|------------|------------|------------|
| HEAD X ACCEL (-G) | 16.5/16.1 | 52.1/52.0 | 79.3/77.5 |
| HEAD Z ACCEL (-G) | 6.4/6.0* | — | 61.1/54.5* |
| CHEST X ACCEL (-G) | 13.3/13.7 | — | 51.3/55.7* |
| LUMBAR X ACCEL (-G) | 13.9/13.3 | 30.3/30.4 | 44.0/44.0 |
| NECK X FORCE (LB) | 164/169 | 511/510 | 778/770 |
| NECK Z FORCE (LB) | 77/64* | 266/292* | 462/337* |
| LUMBAR X FORCE (-LB) | 121/109* | 1208/1207 | 2091/2051 |
| NECK MY TORQ (LB*IN) | 164/180* | 609/626 | 915/959 |
| | | | |
| HEAD X ACCEL (MS) | 105/103 | 88/89 | 78/79 |
| HEAD Z ACCEL (MS) | 94/95 | — | 66/68 |
| CHEST X ACCEL (MS) | 91/93 | — | 61/62 |
| LUMBAR X ACCEL (MS) | 76/75 | 58/59 | 58/60 |
| NECK X FORCE (MS) | 111/112 | 88/89 | 79/80 |
| NECK Z FORCE (MS) | 243/242 | 75/76 | 62/90* |
| LUMBAR X FORCE (MS) | 100/101 | 90/92 | 78/79 |
| NECK MY TORQ (MS) | 110/111 | 83/85 | 73/75 |
| | | | |
| CHANNEL (-Gx) | 40G (2) | 45G | |
| HEAD X ACCEL (-G) | 100/98.8 | 117/109* | |
| HEAD Z ACCEL (-G) | 103/97.4* | 109/97.5* | |
| CHEST X ACCEL (-G) | 63.5/71.4* | 71.2/77.8* | |
| LUMBAR X ACCEL (-G) | 96.4/108* | 98.4/109* | |
| NECK X FORCE (LB) | 984/956 | 1169/1087* | |
| NECK Z FORCE (LB) | — | 786/746* | |
| LUMBAR X FORCE (-LB) | 2793/2749 | 3943/3828 | |
| NECK MY TORQ (LB*IN) | 1443/1511 | 1609/1757* | |
| | | | |
| HEAD X ACCEL (MS) | 74/76 | 70/70 | |
| HEAD Z ACCEL (MS) | 68/76* | 72/73 | |
| CHEST X ACCEL (MS) | 57/58 | 52/54 | |
| LUMBAR X ACCEL (MS) | 44/45 | 41/43 | |
| NECK X FORCE (MS) | 74/73 | 70/71 | |
| NECK Z FORCE (MS) | — | 72/73 | |
| LUMBAR X FORCE (MS) | 74/75 | 71/71 | |
| NECK MY TORQ (MS) | 69/70 | 65/67 | |

*RAM data deviating more than 5% from ADACS data

TABLE 20
PERCENT LARGE ADAM RAM DATA
WITHIN 5% OF ADACS DATA

| CHANNEL (+Gy) | PEAK MAG | TIME-TO-PEAK |
|----------------|----------|--------------|
| HEAD Y ACCEL | 100% | 100% |
| HEAD Z ACCEL | 100% | 100% |
| CHEST Y ACCEL | 100% | 100% |
| LUMBAR Y ACCEL | 100% | 83% |
| NECK Y FORCE | 83% | 83% |
| NECK Z FORCE | 100% | 100% |
| LUMBAR Y FORCE | 50% | 67% |
| NECK MX TORQUE | 100% | 100% |

| CHANNEL (-Gx) |
|----------------|
| HEAD X ACCEL |
| HEAD Z ACCEL |
| CHEST X ACCEL |
| LUMBAR X ACCEL |
| NECK X FORCE |
| NECK Z FORCE |
| LUMBAR X FORCE |
| NECK MX TORQUE |

TABLE 21
WILCOXON SIGNED RANK TEST SUMMARIES FOR
LARGE ADAM RAM VS. ADACS DATA

| CHANNEL (+GY) | PEAK MAG | TIME-TO-PEAK |
|----------------|-------------|--------------|
| HEAD Y ACCEL | 0.0% (NSD) | +0.8% — |
| HEAD Z ACCEL | -1.5% (.10) | +0.8% (.10) |
| CHEST Y ACCEL | 0.0% (NSD) | +1.2% (NSD) |
| LUMBAR Y ACCEL | 0.0% (NSD) | +1.5% (.10) |
| NECK Y FORCE | -0.4% (NSD) | -2.4% (NSD) |
| NECK Z FORCE | +0.6% (NSD) | -0.8% — |
| LUMBAR Y FORCE | +2.8% (NSD) | -0.5% (NSD) |
| NECK MX TORQUE | -0.4% (NSD) | +0.8% (.10) |

| CHANNEL (-Gx) |
|----------------|
| HEAD X ACCEL |
| HEAD Z ACCEL |
| CHEST X ACCEL |
| LUMBAR X ACCEL |
| NECK X FORCE |
| NECK Z FORCE |
| LUMBAR X FORCE |
| NECK MY TORQUE |

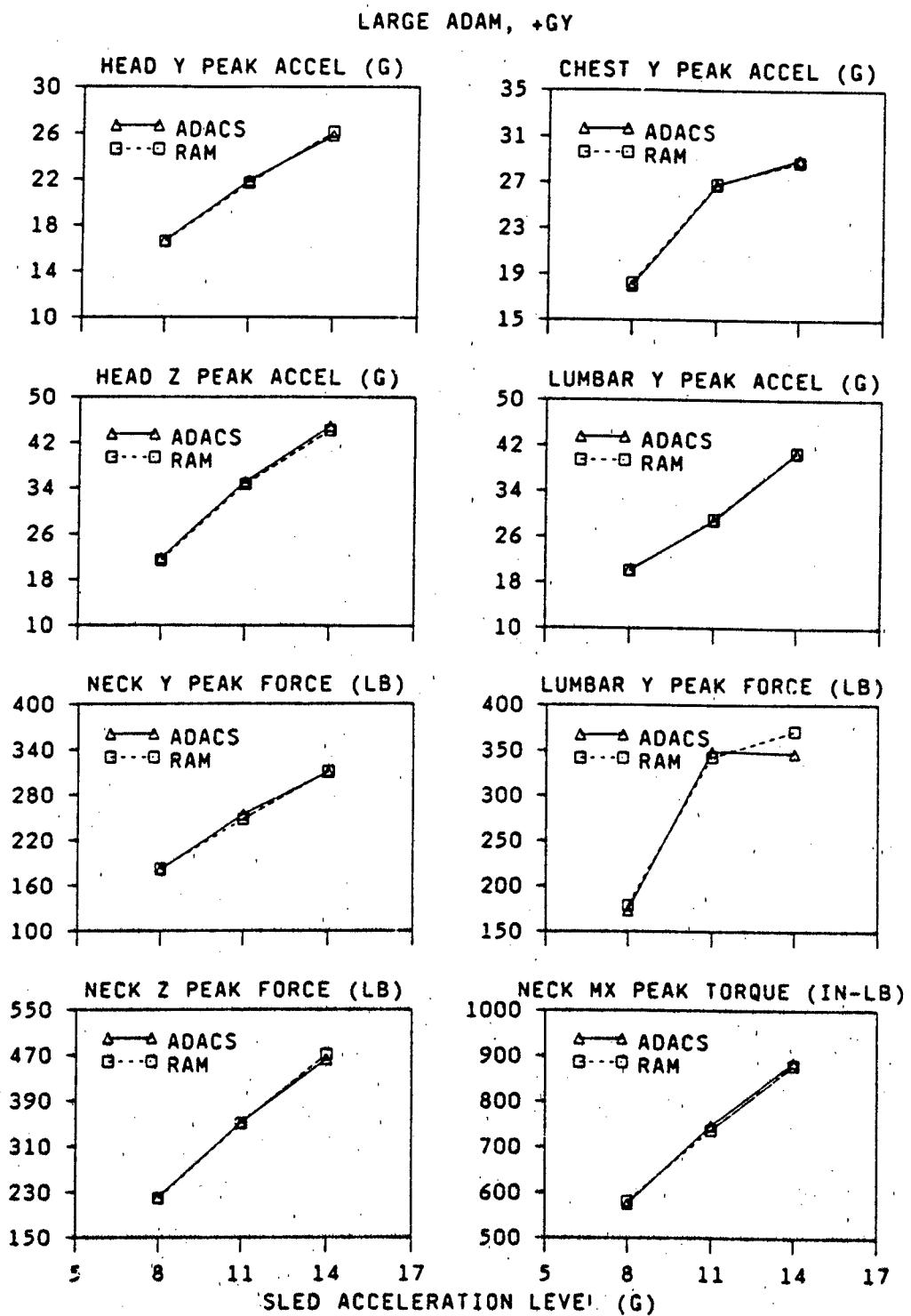


FIGURE 12. LARGE ADAM +GY DYNAMIC RESPONSES VS. CARRIAGE ACCELERATION

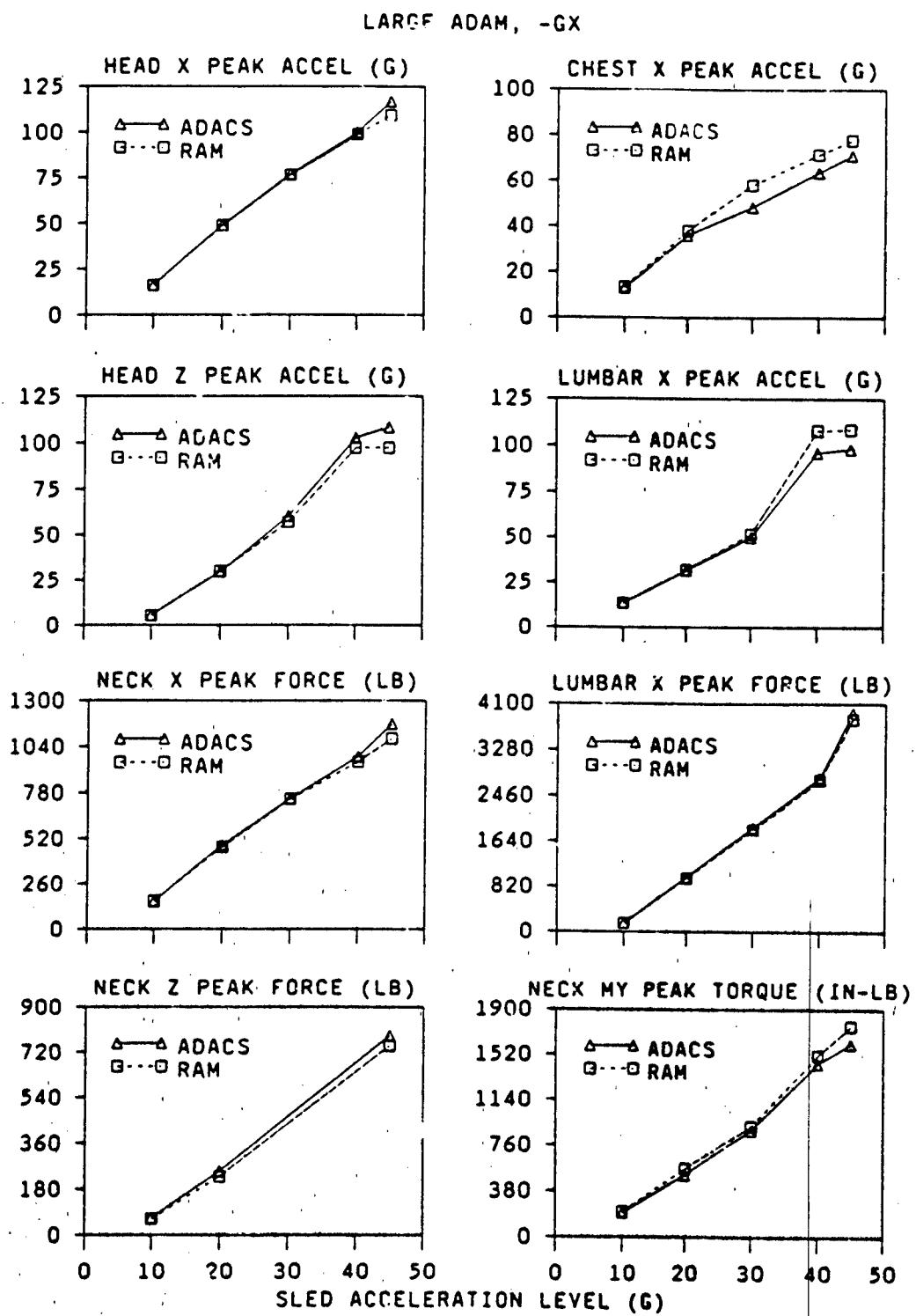


FIGURE 13. LARGE ADAM -GX DYNAMIC RESPONSES VS. CARRIAGE ACCELERATION

Temperature measurement

Wilcoxon Signed Rank tests were performed to compare the ADAM RAM internal peak temperature measurements with those of the ADACS, and are summarized in Table 22. In the +Gy tests, the RAM mean temperature was significantly lower in both the small ADAM (-21%) and the large ADAM (-22%) than the corresponding ADACS data. In the -Gx tests, however, the RAM temperature was slightly higher than the ADACS in both ADAMs, although the differences were not statistically significant. The large difference in the temperature measurements between the +Gy and the -Gx tests was due to the addition of ADAM voltage offsets into the ADACS calculations prior to the -Gx tests. After the adjustments were made, the temperature differences between the ADAM and the ADACS systems in the -Gx tests were reasonable considering the relatively low resolution (3.9° C / bit) of the ADAM temperature measurement system.

TABLE 22
WILCOXON SIGNED RANK TEST SUMMARIES FOR ADACS VS
RAM PEAK TEMPERATURE COMPARISONS ($\alpha = 0.05$)

| +Gy | ADACS | RAM | % CHANGE |
|------------|---------|---------|----------|
| SMALL ADAM | 126° C | 100° C | -21% |
| LARGE ADAM | 108° C | 84.5° C | -22% |
| -Gx | | | |
| SMALL ADAM | 77.1° C | 80.7° C | NSD |
| LARGE ADAM | 81.8° C | 87.8° C | NSD |

Extraneous data

Excessive noise was first observed on several small ADAM channels after the initial small ADAM test. To prevent recurrence of the noise, .01 uF capacitors were installed in the noisy small ADAM channel lines. These were not entirely effective since the noise continued to a lesser extent throughout the small as well as the large ADAM tests. Table 23 lists the ADAM channels with the highest observable noise levels along with the criteria for designating those channels as such. Small ADAM test 3484 was not included since the capacitive filters were not installed until after this test. Note that even with the filters, more noisy channels were present in the small ADAM tests (17) than in the large ADAM tests (8). The noise was not randomly distributed among all the channels in either ADAM but instead tended to recur in the same relatively small number of channels. The occurrence of the noise appeared to be unrelated to impact since it was apt to occur at any time before, during, or after the acceleration impulse. Since the ADACS system, which had its input lines tapped directly from the ADAM sensors, showed little or no noise throughout the tests, defective sensors and/or high amplitude external noise would appear to be unlikely causes. Also unlikely to have contributed to the

noise levels were defects in the electronic signal conditioning, since this network is essentially the same for all channels (the low-level channels as a group, however, do require more amplification than the high-level channels). A more likely cause would be loose, partially broken, or improperly shielded internal wires and faulty connections. Additional ADAM design work may be needed to either eliminate the cause of the noise or increase the effectiveness of the channel filtering.

TABLE 23
SUMMARY OF DATA NOISE

| SMALL ADAM | | LARGE ADAM | |
|---------------------------|-------------------|---------------------------|-------------------|
| CHANNEL | NO. OF NOISY DATA | CHANNEL | NO. OF NOISY DATA |
| X-LUMBAR ACCEL | 3 | Z-CHEST ACCEL | 3 |
| Y-LUMBAR ACCEL | 1 | Y-LUMBAR ACCEL | 2 |
| LEFT LOWER LEG TORQUE NEG | 2 | Y-CHEST ACCEL | 1 |
| Y-LUMBAR MOMENT | 4 | X-CHEST ACCEL | 1 |
| RT STERN ELEV | 4 | LEFT LOWER LEG TORQUE NEG | 1 |
| RT HIP SUPINE ABD/ADD | 3 | TOTAL | 8 |
| TOTAL | 17 | | |

CRITERIA FOR DESIGNATION OF NOISY DATA

ACCELEROMETER: NOISE LEVEL > 4 G
 LOAD CELL: NOISE LEVEL > 500 LB-IN
 POSITION SENSOR: NOISE LEVEL $> 8^\circ$

High amplitude spikes were present in much of the ADAM test data, usually occurring after maximum acceleration. The spikes were either single or multiple and most were of negative polarity. Unlike the occurrences of noise, the spikes were present in many different channels (16 in the large ADAM and 7 in the small ADAM). Table 24 summarizes the occurrences of spikes in both ADAMs. Many more spikes occurred in the large ADAM (37) than in the small ADAM (7) and many more were present in the DECOM systems of both ADAMs (38) than in the RAM systems (6). The spikes presented problems in the data analysis. Due to their large amplitude, which was usually larger than the response itself, filtering of the data was required. This involved accessing the response files and eliminating the data during the time of the spike for each affected channel. Also, the scaling of the "quick look" plots was disproportionate to the response amplitude since the entire spike had to be included in the plot. The occurrence of the spikes after maximum acceleration and the fact that 86% occurred in the DECOM as opposed to the RAM system indicates that the

source of the spikes was probably between the DECOM takeoff connection and the whip cable connection. Possible causes could be faulty wiring between the DECOM takeoff connection and the whip cable connection or improper shielding in the whip cable connection.

TABLE 24
SUMMARY OF DATA SPIKES

| SENSOR | SMALL ADAM | | LARGE ADAM | |
|-----------------|------------|-----|------------|-----|
| | DECOM | RAM | DECOM | RAM |
| ACCELEROMETER | 2 | 1 | 5 | 0 |
| LOAD CELL | 3 | 0 | 12 | 5 |
| POSITION SENSOR | 1 | 0 | 15 | 0 |
| | 6 | 1 | 32 | 5 |

Reliability of ADAM Instrumentation

are summarized in Table 25. For the small ADAM, 4 tests of the tests were considered ADAM failures. They occurred at 11 G in the +Gy tests, and 40 G and 45 G in the -Gx tests. For the large ADAM, 5 out of 18, or 27.8% of the tests were considered failures. They occurred at -20 G (2), -30 G, and -40G (2), and -45 G (1). All the failures of both ADAMs were due to electrical instrumentation and data collection systems, which were identified as hardware related. For further details, see Test Narrative.

TABLE 25
SUMMARY OF ADAM FAILURES

| TEST NO. | ADAM | ACCEL. LEVEL | PROBLEM | CAUSE |
|----------|------|--------------|-----------------------|-------------------------------|
| 3484 | S | +8 Gy | NO RAM DATA | MEMORY BOARD FAILURE |
| 3494 | S | +11 Gy | NO RAM/DECOM DATA | DIGITAL I/O BOARD FAILURE |
| 3499 | L | -20 Gx | Z-HEAD ACCEL CHANNEL | DEFECTIVE WIRE |
| 3505 | L | -20 Gx | X-CHEST ACCEL CHANNEL | DEFECTIVE WIRE |
| 3518 | L | -30 Gx | Z-NECK FORCE CHANNEL | DEFECTIVE WIRE |
| 3521 | L | -40 Gx | Z-NECK FORCE CHANNEL | DEFECTIVE WIRE |
| 3523 | S | -40 Gx | LARGE SPIKE IN DATA | UNDETERMINED |
| 3525 | L | -40 Gx | Z-NECK FORCE CHANNEL | DEFECTIVE HEAD/NECK LOAD CELL |
| 3526 | S | -45 Gx | NO DECOM DATA | UNDETERMINED |

Hardware

In the small ADAM, circuit board failures occurred during tests in the memory board at +8 Gy and the digital I/O board at +11 Gy. The digital I/O board also failed during a pre-test at -10 Gy. In the large ADAM, a circuit board failure occurred during a pre-test in the CRIB (Crest Interface Board) at -30 Gy.

Three types of transducers were employed in the large and small ADAMs. These were accelerometers, load cells, and position sensors. All three types performed very reliably, with only two recorded instances of failure. These were the large ADAM pit sternoaxial leg generation/retraction position sensor after a -10 Gy test and the large ADAM head/neck z-axis load cell after a -40 Gy test. It should also be noted that in large ADAM tests at -30 Gy and -40 Gy, the V-Lumbar Moment load cell was saturated due to its rated value of ± 3000 l-l-r being exceeded by more than 10% during the tests.

Most of the problems associated with defective ADAM test data were due to breaks in wires and faulty connections to internal components, especially transducers, in both large and small ADAM. Table 26 gives a summary of the combined +Gy and -Gy locations for faulty wiring and connections. The main sources of these problems were in the wiring and connections to the knee load cells of both ADAMs, the position sensors of both ADAMs, and the accelerometers of the large ADAM.

TABLE 26
SUMMARY OF FAULTY WIRES/CONNECTIONS

| SMALL ADAM | LARGE ADAM |
|------------------------|------------|
| ACCELEROMETERS | 5 |
| LOAD CELLS, KNEE | 7 |
| LOAD CELLS, OTHER | 2 |
| POSITION SENSORS | 9 |
| START SIGNAL WIRE | 1 |
| CPU BOARD INTERCONNECT | |
| TOTAL | 24 |

Data transfer

The transfer of both the RAM and DECOM test data from the ADAM to the DRASS unit was efficient and reliable. No loss of data in any of the tests was shown to have occurred as a result of a malfunction of the DRASS unit. However, DECOM test data was lost in test 3502 due to the DRASS unit being incorrectly set in the "download" position during the test. The DECOM test data was also lost in test 3526 and since no cause was determined, the possibility of a similar DRASS operator error or a DRASS malfunction should

be considered. In one other test, the battery system of the DRASS was discovered to be low prior to the actual data collection, and a slight delay occurred while recharging was performed.

Regarding the transfer of data to the computers, no problems were attributed to either the DRASS to Z-100 or the Z-100 to VAX transfer of the ADAM data.

Procedural checks and measurements

ADAM pre and post electrical checks both required several minutes to perform but appeared to be very good indicators of any defective channels. No instances of false channel status were indicated by the hand-held display terminal which was used to perform these checks. However, during the pre electrical check of test 3498, the terminal was observed to have been loading down the "start signal". This was due to the terminal having been left in the incorrect mode after a previous ADAM maintenance was performed.

Lists of ADAM channel sensitivities and polarities were submitted prior to testing and were revised when necessary. In both the +Gy and -Gx tests, some of the polarities of the ADAM channels initially did not match those of the ADACS channels and had to be revised. During the -Gx tests it was discovered that several position channels were showing inverted responses and new sets of polarities were submitted for those channels.

When the initial ADAM channels sensitivities list was compiled, no offset voltages were used in the gain computations. Also, it was determined that the voltage standard was out of calibration at the time of the measurements. Therefore, the initial ADAM sensitivities list resulted in incorrect magnitude response measurements for the entire series of +Gy tests. The sensitivities were revised using the offset voltages and a correct voltage standard, and the +Gy response data was reprocessed.

Due to the large range of sled acceleration levels in the -Gx tests (10 G to 45 G), it was decided to employ increased sensitivities for some channels at lower G levels and decreased sensitivities at higher G levels. The sensitivities of the z-axis accelerometers were not revised as planned and the first 30 G test was completed with the incorrect decreased sensitivities. However, no saturated data were observed. In another instance, it became necessary to revise the sensitivity of the Y-Lumbar Moment channel due to transducer saturation. However, the new sensitivity was not submitted on time and the RAM data had to be reprocessed.

In summary, the procedural methods for determining, revising, and submitting the ADAM channel sensitivities and polarities did not appear to be very efficient. It should be noted, however, that there was often a limited amount of time between ADAM tests which could have contributed to some of the procedural problems.

Stability of ADAM Instrumentation

System stability indicators

Although the ADAM channel sensitivities were revised several times for various reasons (see previous section), no accurate data were available for comparison of the sensitivities before and after the two series of tests. Therefore, the exact effect of impact on the channel sensitivities and system gain over both entire series of tests could not be determined.

One indicator of the system stability in the ADAM low-level channels was the difference between the pre-impact RCal-NonRCal values and the post-impact RCal-NonRCal values which was printed out in hex after each test. A change in this value in any channel indicated a change in the system gain during impact for that channel. Table 27 shows that the change in these values exceeded two bits in 3.7% of the small ADAM individual channel tests and 1.7% of the large ADAM tests. The values exceeded three bits in less than 1% of the tests in both ADAMs. It would appear, therefore, that the range of error of the ADAM instrumentation output at the measured RCal levels was ± 3 bits, or ± 0.12 volts per test. However, this range does not take into consideration the cumulative change in output over a series of tests.

TABLE 27
DIFFERENCES BETWEEN PRE- AND POST-IMPACT
RCAL-NONRCAL DATA

| | TOTAL NO. DATA | NO. BITS CHANGE IN CALIBRATION | | | | |
|------------|-------------------|--------------------------------|--------|--------|--------|--------|
| | | 3 BITS | 4 BITS | 5 BITS | 6 BITS | 7 BITS |
| SMALL ADAM | 628 | 17 | 3 | 1 | 1 | 1 |
| LARGE ADAM | 517 | 6 | 1 | 2 | 0 | 0 |

Repeatability of response

Four pairs of -Gx repeatability tests were run with each test pair having its own set of parameters as to subject, G-level, and harness type. Both tests in each pair were performed consecutively in the test schedule. The percentage of change in peak magnitude (G) and time-to-peak (MS) between identical tests for both small and large ADAM RAM data are shown in tables 28 and 29. No statistical tests could be performed due to the small number of pairs. The results, however, appear to indicate a trend of poorer peak magnitude repeatability with increasing G-level, as indicated by the generally higher percentages in the 30 G test pairs as opposed to the 20 G pairs. The data also appear to indicate better peak magnitude repeatability in the small ADAM than in the large ADAM, with a wide range of percentages observed in both ADAMs. The time-to-peak data showed only small variations in the test pairs, with the exception of the large ADAM Lumbar X Acceleration and Neck Z Force data.

TABLE 28
SMALL ADAM DYNAMIC RESPONSE REPEATABILITY

| CHANNEL (-GX) | 20G | 30G |
|----------------------|--------|--------|
| HEAD X ACCEL (G) | -2.1% | +15.0% |
| HEAD Z ACCEL (G) | -23.9% | +11.5% |
| CHEST X ACCEL (G) | -3.2% | -11.5% |
| LUMBAR X ACCEL (G) | -2.0% | -21.9% |
| NECK X FORCE (LB) | -3.3% | +16.2% |
| NECK Z FORCE (LB) | -6.6% | +18.2% |
| LUMBAR X FORCE (LB) | +12.5% | +17.1% |
| NECK MY TORQ (LB-IN) | -6.7% | -6.6% |

| CHANNEL (MS) | 20G | 30G |
|---------------------|-------|-------|
| HEAD X ACCEL (MS) | 0.0% | 0.0% |
| HEAD Z ACCEL (MS) | +1.4% | 0.0% |
| CHEST X ACCEL (MS) | -5.6% | -2.0% |
| LUMBAR X ACCEL (MS) | +3.3% | 0.0% |
| NECK X FORCE (MS) | -2.4% | +0.0% |
| NECK Z FORCE (MS) | +1.0% | -1.2% |
| LUMBAR X FORCE (MS) | 0.0% | +1.3% |
| NECK MY TORQ (MS) | -5.3% | 0.0% |

TABLE 29
LARGE ADAM DYNAMIC RESPONSE REPEATABILITY

| CHANNEL (-GX) | 20G | 30G |
|----------------------|--------|--------|
| HEAD X ACCEL (G) | -7.0% | -7.3% |
| HEAD Z ACCEL (G) | +7.6% | -26.5% |
| CHEST X ACCEL (G) | — | +14.2% |
| LUMBAR X ACCEL (G) | -37.5% | -42.5% |
| NECK X FORCE (LB) | -9.3% | -10.5% |
| NECK Z FORCE (LB) | -21.1% | — |
| LUMBAR X FORCE (LB) | +12.6% | -10.6% |
| NECK MY TORQ (LB-IN) | +12.8% | -34.4% |

| CHANNEL (MS) | 20G | 30G |
|---------------------|--------|--------|
| HEAD X ACCEL (MS) | -3.4% | 0.0% |
| HEAD Z ACCEL (MS) | 0.0% | 1.5% |
| CHEST X ACCEL (MS) | — | -6.7% |
| LUMBAR X ACCEL (MS) | -10.3% | +26.1% |
| NECK X FORCE (MS) | -3.4% | 0.0% |
| NECK Z FORCE (MS) | +29.7% | — |
| LUMBAR X FORCE (MS) | -5.8% | -3.9% |
| NECK MY TORQ (MS) | -2.4% | -1.4% |

SUMMARY AND CONCLUSIONS

Summary

Large and small production ADAMs were subjected to impacts of up to 14 G in the +y axis and 45 G in the -x axis, in a simulated CREST ejection seat. Tests were conducted using both the CREST X-Band 45° and X-Band 90° harnesses.

Data were recorded for sled acceleration, sled velocity, harness anchor loads, manikin internal temperature, head accelerations, chest acceleration, neck forces, lumbar force, and lumbar acceleration.

The test data were used to evaluate ADAMs' structural adequacy, simulation of human dynamic response, instrumentation accuracy, instrumentation reliability, and electronics stability.

Conclusions

The tests showed the ADAMs to be structurally sound, but prone to circuit board and wiring failures. Heavier gage wire would be appropriate in the joints that see large motions.

Both ADAMs adequately measured the phase and magnitude of the dynamic impact responses over time, but neither ADAM was able to consistently approximate the peak magnitude of the responses to within 5% of the expected values. The low resolution of the ADAM's data conversion system, along with excessive noise in the data, made the dynamic response plots difficult to read and analyze, especially at lower acceleration levels.

The overall simulation of human dynamic response by the ADAMs is very good, though fine tuning of the head and neck might improve the accuracy of the ADAM head accelerations, which were too high relative to the human head accelerations measured in a previous program. Note that these judgments are based on -x axis acceleration conditions, as no data is yet available for human response to +y axis accelerations.

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TEST CONFIGURATION AND
DATA ACQUISITION SYSTEM FOR THE
HORIZONTAL IMPACT OF ANTHROPOMORPHIC
MANIKINS (CREST CHIA)
TEST PROGRAM
DURING +Gy AND -Gx ACCELERATIONS

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INTRODUCTION

This report was prepared by DynCorp for the Harry G. Armstrong Aerospace Medical Research Laboratory (AAMRL/BBP) under Air Force Contract F33615-86-C-0531.

The information provided herein describes the test facility, seat fixture, restraint configurations, seat cushions, test subjects, data acquisition, instrumentation procedures and the test configurations that were used in the Horizontal Impact of Anthropomorphic Manikins (CREST CHIA) Test Program During +Gy And -Gx Accelerations. Forty-four tests were conducted during November and December 1988 on the Horizontal Accelerator test facility.

1. TEST FACILITY

The AAMRL Horizontal Accelerator Facility was used for all of the forty-four tests. The Horizontal Accelerator Facility consists of the 24-inch HYGE actuator, the test sled and 240 feet of track. The Horizontal Accelerator is designed to simulate an impact profile by accelerating the test sled down the track.

The energy required to produce the impact acceleration is generated within the actuator cylinder (Figure A-1) by means of differential gas pressures acting upon a thrust piston. This thrust piston is attached to a thrust column assembly which is used to impact the sled. As pressure moves the thrust assembly, the sled is accelerated from an initial stationary position to a predetermined peak acceleration level and is then allowed to decelerate by coasting or by brake application. Various acceleration profiles may be obtained by changing the differential pressures, the travel length of the thrust assembly and the metering structure on the thrust piston. The sled glides along the track rails on twelve glide pads. The sled braking system consists of caliper brakes which grip the track rails when activated by onboard compressed nitrogen gas. The track rails are one inch thick and the total track length is 240 feet. For this test program, the Bendix Square Wave Pin (pin number 2) was used.

2. SEAT FIXTURE

The experimental seat fixture was the 40 G seat mounted on the Horizontal Accelerator Sled. The seat fixture was modified to represent the CREST seat in an F-16 cockpit. For the -Gx configuration tests, a 17 degree wedge was used placing the seat back angle 30 degrees aft of vertical and the seat pan 30 degrees above horizontal. Figure A-2 illustrates the -Gx configuration seat fixture.

For the +Gy configuration tests, the seat back angle was 13 degrees aft of vertical and the seat pan was 13 degrees above horizontal. Figure A-3 illustrates the +Gy configuration seat fixture.

The subject was secured in the seat with lower-torso restraint straps and shoulder straps. These straps were preloaded as required in the test plan.

3. RESTRAINT CONFIGURATIONS

Two restraint configurations were tested. The two restraint configurations consisted of variations of the X-Band harness. The configurations differed only in the attachment locations of the lower-torso restraint straps; 90 degrees (designated X-Band-90) and 45 degrees (designated X-Band-45) relative to the z axis.

The X-Band-45 harness is illustrated in Figure A-3 with the manikin secured in the +Gy seat fixture. The X-Band-90 harness is illustrated in Figure A-4 with the manikin secured in the -Gx seat fixture.

4. SEAT CUSHIONS

The CREST cushion was used during this test program. The CREST cushion is a one-inch thick ConforTM C45FR foam cushion coated with Selastic-E RTV. The CREST cushion was used on both the seat pan and seat back as illustrated in Figure A-2.

An extra cushion was used for the -Gx configuration when testing the Small ADAM manikin. This extra cushion was attached to the CREST seat back cushion with velcro and was used to obtain the shoulder preloads as required in the test plan. This extra cushion uses four, one-half inch thick ConforTM C47 foam layers, separated by NOMEX fabric. This extra seat cushion, installed on the -Gx Configuration seat fixture is illustrated in Figure A-5.

5. TEST SUBJECTS

Two manikins, the large and small Advanced Dynamic Anthropomorphic Manikins (ADAMs), were used during this test program.

6. INSTRUMENTATION

The electronic data collected during this test program is described in Sections 6.1 and 6.2. Section 6.1 discusses accelerometers while Section 6.2 discusses load transducers. Section 6.3 discusses the calibration procedures that were used. The measurement instrumentation used in this

test program are listed in Tables A-1a through A-1d for the +Gy acceleration configuration and Tables A-2a through A-2d for the -Gx acceleration configuration. These figures designate the manufacturer, type, serial number, sensitivity and other pertinent data on each transducer used. Table A-3 lists the manufacturer's typical transducer specifications.

Accelerometers and load transducers were chosen to provide the optimum resolution over the expected test load range. Full scale data ranges were chosen to provide the expected full scale range plus 50% to assure the capture of peak signals. All transducer bridges were balanced for zero output prior to the start of each test. The accelerometers were adjusted for the effect of gravity using computer processing software. The component of a 1 G vector in line with the force of gravity that lies along the accelerometer axis was added to each accelerometer.

The accelerometer and load transducer coordinate systems are shown in Figure A-6. The seat coordinate system is right-handed with the z axis parallel to the seat back and positive in the direction of the subject's head. The x axis is perpendicular to the z axis and positive eyes forward from the subject. The y axis is perpendicular to the x and z axes according to the right hand rule. The origin of the seat coordinate system is designated as the seat reference point (SRP). The SRP is at the midpoint of the line segment formed by the intersection of the seat pan and seat back. All vector components (for accelerations, angular accelerations, forces, moments, etc.) are positive when the vector component (x, y and z) is in the direction of the positive axis.

The linear accelerometers were wired to provide a positive output voltage when the acceleration experienced by the accelerometer is applied in the +x, +y and +z directions, as shown in Figure A-6.

The angular Ry accelerometers were wired to provide a positive output voltage when the angular acceleration experienced by the angular accelerometer is in the +y direction according to the right hand rule, as shown in Figure A-6.

The load cells and strain gages were wired to provide a positive output voltage when the force exerted by the load cell on the subject is applied in the +x, +y or +z directions, as shown in Figure A-6.

The Mx torque transducer was wired to provide a positive output voltage when the torque experienced by the transducer is applied in the +x direction according to the right hand rule as shown in Figure A-6.

Sled velocity was measured using Globe Industries tachometer Model 22A672-2. The rotor of the tachometer was attached to an aluminum wheel with a rubber O-ring around its circumference to assure good rail contact. The wheel contacted the track rail and rotated as the sled moved, producing an output voltage proportional to the velocity.

6.1 Accelerometers

This section describes the accelerometer instrumentation as required in the AAMRL/BBP test plan.

The external chest accelerometer package consisted of three Endevco Model 7264-200 linear accelerometers, mounted to a 1/2 x 1/2 x 1/2 inch aluminum block, for accelerations in the x, y and z directions. An Endevco Model 7302A angular (Ry) accelerometer was mounted on a bracket adjacent to the triaxial chest block. The accelerometer packages were inserted into a steel protection shield to which a length of Velcro fastener strap was attached. The package was placed over the subject's sternum at the level of the xyphoid and was held there by fastening the Velcro strap around the subject's chest. Figure A-7 illustrates the chest accelerometer package.

The Horizontal Accelerator ram acceleration was measured using an Endevco Model 2262A-200 accelerometer. The accelerometer was mounted near the front surface of the ram, off the sled, and used as a backup to the primary sled mounted accelerometer.

Sled accelerations were measured using three Endevco accelerometers: one Model 2262A-200 for accelerations in the x direction (accelerations in the y direction for the +Gy configuration), one Model 2264-200 for accelerations in the y direction (accelerations in the x direction for the +Gy configuration) and one Model 2264-200 for accelerations in the z direction. Two separate aluminum blocks were used to mount the three accelerometers, sled x on one block (sled y for the +Gy configuration) and sled y (sled x for the +Gy configuration) and z on the other block. Both blocks and their respective accelerometers were mounted on the underside center of the sled.

Seat back accelerations were measured using three Endevco Model 2264-200 linear accelerometers for accelerations in the x, y and z directions. The three linear accelerometers were attached to a 1 x 1 x 3/4 inch acrylic block and were mounted behind the seat back.

For Large and Small ADAM manikin +Gy configuration tests, head y and z acceleration, chest y acceleration, and Lumbar y acceleration were each measured using Entran EGA-125F-1000 linear accelerometers. For Large and Small ADAM manikin -Gx configuration tests, head x and z acceleration, chest x acceleration, and lumbar x acceleration were each measured using Entran EGA-125F-1000 linear accelerometers. These accelerometers were internally mounted in the manikins.

6.2 Load Transducers

This section describes the load transducer instrumentation as required in the AAMRL/BBP test plan.

The load transducer locations and dimensions are shown in Figures A-8 and A-9 for the -Gx configuration and the +Gy configuration respectively. All dimensions are referenced to the Seat Reference Point (SRP). The

Seat Reference Point is located at the intersection of the seat pan center line (x axis) and the seat back (z axis) center line.

Shoulder/anchor forces were measured using two GM-3D-SW, one GM/DYN 3D-SW and three AAMRL/DYN 3D-SW triaxial load cells, each capable of measuring forces in the x, y and z directions. The parameters measured are indicated below:

Left shoulder x, y and z force
Right shoulder x, y and z force

X-Band-90 and X-Band-45 harnesses:
Left horizontal x, y and z anchor force
Right horizontal x, y and z anchor force
Left vertical x, y and z anchor force
Right vertical x, y and z anchor force

Shoulder roller y and z forces and the shoulder roller torque (M_x) were measured using a strain gaged T-Bar (shoulder harness roller bracket). This specially instrumented T-Bar was fabricated by DynCorp using Micro Measurement Model EA-06-125BZ-350 strain gages.

The left and right shoulder anchor load cells are illustrated by Figure A-10. Also shown is the T-Bar (shoulder harness roller bracket) and the roller assembly. The strain gages instrumented on the T-Bar can be seen in Figure A-11.

The left horizontal and vertical anchor load cells are illustrated by Figure A-12 while Figure A-13 shows the right horizontal and vertical anchor load cells. Both Figures A-12 and A-13 represent the +Gy test configuration and the X-Band-45 harness attachments.

Figure A-14 shows the right horizontal and vertical anchor load cells for the -Gx test configuration and the X-Band-90 harness attachments.

For Large and Small ADAM manikin +Gy configuration tests, head/neck y and z forces and M_x torque were measured using a Denton Model 1716 load cell while Lumbar y force was measured using a Denton Model 1914 load cell. For Large and Small ADAM manikin -Gx configuration tests, head/neck x and z forces and M_y torque were measured using a Denton Model 1716 load cell while lumbar x force was measured using a Denton Model 1914 load cell. These load cells were internally mounted in the manikins.

6.3 Calibration

Calibrations were performed before and after testing to confirm the accuracy and functional characteristics of the transducers. Pre-program and post-program calibrations are given in Tables A-4a through A-4g.

The calibration of the accelerometers was performed by DynCorp using the comparison method (Ensor, 1970). A laboratory standard accelerometer, calibrated on a yearly basis by Endevco with standards traceable to the

National Bureau of Standards, and a test accelerometer were mounted on a shaker table. The frequency response and phase shift of the test accelerometer were determined by driving the shaker table with a random noise generator and analyzing the outputs of the accelerometers with a PDP 11/15 computer and 1923 Time Data Unit using Fourier analysis. The natural frequency and the damping factor of the test accelerometer were determined, recorded and compared to previous calibration data for that test accelerometer. Sensitivities were calculated at 40 G and 100 Hertz. The sensitivity of the test accelerometer was determined by comparing its output to the output of the standard accelerometer.

The angular accelerometers were calibrated by DynCorp by comparing their output to the output of a linear standard accelerometer. The angular accelerometer is mounted parallel to the axis of rotation of a Honeywell low inertia D. C. motor. The standard accelerometer is mounted perpendicular to the axis of rotation at a radius of one inch to measure the tangential acceleration. The D. C. motor motion is driven at a constant sinusoidal angular acceleration of 100 Hertz and the sensitivity is calculated by comparing the rms output voltages of the angular and linear accelerometers.

The load cells and strain gages were calibrated by DynCorp. These transducers were calibrated to a laboratory standard load cell in a special test fixture. The sensitivity and linearity of each test load cell were obtained by comparing the output of the test load cell to the output of the laboratory standard under identical loading conditions. The laboratory standard load cell, in turn, is calibrated by PMEL on a periodic basis.

The velocity wheel is calibrated periodically by DynCorp by rotating the wheel at approximately 2000, 4000, and 6000 revolutions per minute (RPM) and recording both the output voltage and the RPM.

7. DATA ACQUISITION

Data acquisition was controlled by a comparator on the Master Instrumentation Control Unit in the Instrumentation Station. The test was initiated when the comparator countdown clock reached zero. The comparator was set to start data collection at a preselected time.

A reference mark pulse was generated to mark the ADACS electronic data at a preselected time after test initiation to place the reference mark close to the impact. At the same time, the reference mark pulse triggered a strobe light to mark the test photogrammetric data. The reference mark time was used as the start time for data processing of the electronic and photogrammetric data.

Prior to each test and prior to placing the subject in the seat, data were recorded to establish a zero reference for all data transducers. These data were stored separately from the test data and were used in the processing of data.

7.1 Automatic Data Acquisition and Control System (ADACS)

Installation of the ADACS instrumentation for the +Gy and -Gx test configurations are shown in Figures A-15 and A-16 respectively. The three major components of the ADACS system are the power conditioner, signal conditioners and the encoder. A block diagram of the ADACS is shown in Figure A-17. The signal conditioners contain forty-eight amplifiers with programmable gain and filtering.

Bridge excitation for load cells and accelerometers was 10 VDC. Bridge completion and balance resistors were added as required to each module input connector.

The forty-eight module output data signals were digitized and encoded into forty-eight 11-bit digital words. Two additional 11-bit synchronization (sync) words were added to the data frame making a fifty word capability.

Three synchronization pulse trains (bit sync, word sync and frame sync) were added to the data frame and sent to the computer via a junction box data cable.

The PDP 11/34 minicomputer received serial data from the ADACS. The serial data coming from the sled are converted to parallel data in the data formatter. The data formatter inputs data by direct memory access (DMA) into the computer memory via a buffered data channel where data are temporarily stored on disk. Data are later transferred to the VAX 11/750 and output to magnetic tape for permanent storage.

The interrelationships among the data acquisition and storage equipment are shown in Figure A-18.

Test data could be reviewed immediately after each test by using the "quick look" SCAN routine. SCAN was used to produce a plot of the data stored on any channel as a function of time. The routine determined the minimum and maximum values of any data plot. It was also used to calculate the rise time, pulse duration, sled acceleration and create a disk file containing significant test parameters.

7.2 Photogrammetric Data Acquisition

Two onboard high-speed LOCAM cameras, operating at 500 frames per second, were used to produce the photogrammetric data for the +Gy test configuration. The front camera was a LOCAM Model 50-0002 (S/N 374) and the oblique camera was a LOCAM Model 50-0002 (S/N 387). The front camera used a 10mm lens (S/N 665054) and the oblique camera used a 12.5mm lens (S/N 12728). The two camera locations are shown in Figure A-3.

Two onboard high-speed LOCAM cameras, operating at 500 frames per second, were used to produce the photogrammetric data for the -Gx configuration tests 3498 through 3523. The side camera was a LOCAM Model 50-0002 (S/N 374) and the oblique camera was a LOCAM Model 50-0002 (S/N 387).

Both cameras used an 9mm lens (S/N 69519 and 72019). For -Gx configuration tests 3524 through 3527 the side camera used was a Photosonics Model 16mm 1B-100 (S/N 906); the oblique camera used was a Photosonics Model 16mm 1B-100 (S/N 673). Both cameras used an 8 mm lens. The two camera locations are shown in Figure A-22.

Motion of the subjects' cheek, mouth, upper chest, lower chest, shoulder, elbow and knee were quantified by tracking the motion of subject-mounted fiducials. Reference fiducials were placed on the test fixture. The size of the fiducials used was a .75" diameter black circle on a 1.25" diameter white target. The locations of the fiducials generally followed the guidelines provided in "Film Analysis Guides for Dynamic Studies of Test Subjects, Recommended Practice" (SAE J138, March 1980). Figures A-19 and A-20 identifies the fiducial target locations for the +Gy test configuration while Figures A-21 and A-22 identifies the fiducial target locations for the -Gx test configuration.

All cameras were automatically started at a preset time in the test sequence by a signal from the camera and lighting control station.

The photogrammetric data were time correlated in each test. Immediately prior to impact, a reference mark signal triggered the flash unit to mark the camera film frame. At that time, a 100 PPS signal activated the camera light emitting diode (LED) driver which activated the camera LED, producing a time mark at the film edge. This reference mark was then used to correlate the photogrammetric data with the electronically measured data.

The photogrammetric data will be processed as required on the Automatic Film Reader (AFR) system, shown in the block diagram in Figure A-23. The fiducial tracking routine is initiated via the Data General terminal. The tracking routine is booted from a floppy disk into the Nova 3/12 memory. The system is capable of tracking fiducials manually or automatically. The Nova 3/12 outputs an x-y film coordinate position to magnetic tape for each fiducial being tracked. Data are transferred from magnetic tape to the DEC PDP 11/34 disk file and then transferred to the DEC VAX 11/750 disk file for processing.

An Instant Analytical Replay (INSTAR) video system was also used to provide coverage of each test. This video recorder and display unit is capable of recording high-speed motion at a rate of 120 frames per second. Immediate replay of the impact is possible in real time or in slow motion.

8. PROCESSING PROGRAMS

Test data for the CREST CHIA Study was collected using two separate data collection systems. The facility instrumentation and the standard subject instrumentation were monitored using the ADACS data collection system. During tests where the ADAM dummy was the subject, additional test data was collected using the ADAM internal data collection system.

The executable images for the ADACS processing programs are located in directory PROCESS of the VAX 11/750 and the test data is assumed to be stored in directory DATA1. All plots and the test summary sheet are output to the LN03 laser printer. The ADACS test summary file is output to directory PROCESS.

The executable images for the ADAM processing programs are located in directory PROCESS of the VAX 11/750. The plots and the test summary sheet are output to the Tektronix hardcopy unit. The ADAM test summary file is output to directory PROCESS.

8.1 ADACS Program Operation

The two Fortran programs that process the ADACS test data for the +Gy configuration of the CREST CHIA Study are named CREST CHIAHAC0A and CHIAHAC0/B. The DCL file which controls the execution of these programs is named CHIAHACGY. The character string 'CHIAHAC' identifies the study, '0' is the revision number and the last character determines the program order of execution.

CHIAHAC0A accepts user input and creates a temporary DCL file which controls the sequential batch processing of a specified number of tests. CHIAHAC0A requests the user to enter the total number of tests to be processed and the test number of each test. Directory DATA1 is assumed to contain a zero reference file named '<test no>Z.HAC', a test data file named '<test no>D.HAC' and a sensitivity file named '<test no>S.HAC'.

CHIAHAC0A requests the user to enter the total number of tests to be processed and the test number for each test. The default test parameters are retrieved from the header block of the test data file and displayed as a menu on the screen. The user may specify new values for any of the displayed test parameters. The test parameters include the subject ID, weight, age, height and sitting height. Additional parameters include the cell type, nominal G level, subject type (manikin or human) and belt preload status (computed or not computed). If the belt preloads were computed, then the shoulder, anchor and roller preloads are also displayed.

CHIAHAC0B does the actual data processing of the test data. CHIAHAC0B generates time histories for the sled, seat and chest linear accelerations, the sled velocity and the chest Ry angular acceleration. Time histories for the shoulder forces, anchor forces, roller forces and roller torque are also generated. In addition, CHIAHAC0B computes time histories for the ADAM internal temperature, head y and z, chest y and lumbar y accelerations, the neck y and z and lumbar y forces, and the neck x axis torque. The impact rise time, duration and velocity change are computed and stored in the test base file.

The output of CHIAHAC0B consists of a test summary file, summary sheet and plots. The summary file contains the preimpact levels and extrema for the individual channels and the derived quantities. The summary sheet displays the extrema in a more readable format. The time histories

of the parameters are plotted to a disk file and sent to the laser printer.

The two Fortran programs that process the ADACS test data for the -Gx configuration of the CREST CHIA Study are named CHIAHAC1A and CHIAHAC1B.

The DCL file which controls the execution of these programs is named CHIAHACGX. Program CHIAHAC1A accepts user input and creates a DCL file which controls the processing of all of the specified tests. Program CHIAHAC1B performs the actual data processing.

All of the ADACS channels that were analyzed for the +Gy configuration of the CREST CHIA Study were also analyzed for the -Gx configuration. However, the ADAM channels analyzed for the -Gx configuration were the ADAM internal temperature, head x and z accelerations, chest x and lumbar x accelerations, neck x and z forces, lumbar x force and neck y axis torque. Due to the change in seat orientation and the higher G levels, the -Gx configuration of the CREST CHIA Study required different plotting scales than the +Gy configuration.

8.2 ADAM Processing Programs

The two Fortran programs that process the ADAM test data are named ADAM_DATA and ADAM_DECOM. ADAM_DATA is an interactive program which converts data collected in internal ram memory into engineering units and plots or lists the resulting time histories. ADAM_DECOM is an interactive program which converts data transmitted real time during the test into engineering units and plots or lists the results. The Fortran library ADAM_PLOTS provides subroutine support for both programs.

ADAM_DATA requests the user to enter the ADAM test data filename, the test number and the reference mark voltage. The reference mark is used to correlate the ADAM data with the ADACS data. The user also specifies whether the output is to be plotted or listed and whether the results are to be stored in a test summary file. The channel numbers, descriptions, sensitivities, offsets and plotting parameters are read in from the channel specification file. Time histories of the channels are plotted or listed for 600 ms starting from the reference mark time. Time zero corresponds to the start of impact.

ADAM_DECOM requests the user to enter both the test data filename (internal ram) and the test decom filename (transmitted). This is necessary because the information required to determine the position of the channels in the frame is not transmitted and must be determined from the internal ram data. ADAM_DECOM also displays the number of frames containing bad sync patterns and requests the user to indicate whether to continue processing the corrupted data. Aside from these differences, ADAM_DECOM is functionally equivalent to ADAM_DATA.

Flowcharts of the ADAM processing programs are not included because they are designed to analyze any ADAM test data and are not specific to this study.

| DIGITAL INSTRUMENTATION REQUIREMENTS | | | | | | | | | |
|---|------------------------|-----------|---------------|------------|---------------|--------------|----------|-------------|------------|
| CREST HORIZONTAL IMPACT OF APPROXIMATELY 1000 G'S | | | | | | | | | |
| PROGRAM: MARTINS NO. 1 (CHIA) TESTS | | | | | | | | | |
| FACILITY: HORIZONTAL ACCELERATION | | | | | | | | | |
| RUN 3481, THRU 3497 | | | | | | | | | |
| DATA CHANNEL | DATA POINT | INSTRUMEN | SERIAL NUMBER | SHOCK SENS | SHOCK V CHAIN | SHOCK FILTER | AMP GAIN | SAMPLE RATE | FILTER 622 |
| | | | | | | | | | |
| 1 | SLID X | ENDENCO | PN31 | 5.013 | 10.00 | 60 | 10 | 1K | 19.90 |
| | | | | uv/0 | | 1 | 1 | 1 | 120 |
| 2 | SLID X | ENDENCO | PN47 | 3.146 | 10.00 | 60 | 50 | 1K | 15.90 |
| | | | | uv/0 | | 2 | 2 | 1 | 120 |
| 3 | SLID X | ENDENCO | PN61 | 2.902 | 10.00 | 60 | 50 | 1K | 11.20 |
| | | | | uv/0 | | 3 | 22 | 1 | 120 |
| 4 | LEFT SHOULDER | GM | 152 | 6.33 | 10.00 | 60 | 201 | 1K | 19651.0 |
| | | | | uv/1.0 | | 1 | 1 | 1 | 120 |
| 5 | LEFT SHOULDER X FORCE | GM | 153 | 5.40 | 10.00 | 60 | 102 | 1K | 11521.0 |
| | | | | uv/1.0 | | 1 | 1 | 1 | 120 |
| 6 | LEFT SHOULDER Y FORCE | GM | 154 | 5.42 | 10.00 | 60 | 102 | 1K | 11111.0 |
| | | | | uv/1.0 | | 6 | 6 | 1 | 120 |
| 7 | RIGHT SHOULDER X FORCE | GM/DY18 | 202 | 6.29 | 10.00 | 60 | 201 | 1K | 19771.0 |
| | | | | uv/1.0 | | 1 | 1 | 1 | 120 |
| 8 | RIGHT SHOULDER Y FORCE | GM/DY18 | 203 | 5.32 | 10.00 | 60 | 102 | 1K | 11691.0 |
| | | | | uv/1.0 | | 5 | 6 | 1 | 120 |
| 9 | RIGHT SHOULDER X FORCE | GM/DY18 | 204 | 4.90 | 0.00 | 60 | 102 | 1K | 12691.0 |
| | | | | uv/1.0 | | 2 | 9 | 1 | 120 |
| 10 | LEFT HON12. X FORCE | AMBL/DY18 | 212 | 7.96 | 10.00 | 60 | 201 | 1K | 15631.0 |
| | | | | uv/1.0 | | 10 | 10 | 1 | 120 |
| 11 | LEFT HON12. Y FORCE | AMBL/DY18 | 213 | 7.15 | 10.00 | 60 | 201 | 1K | 17401.0 |
| | | | | uv/1.0 | | 11 | 11 | 1 | 120 |
| 12 | RIGHT HON12. X FORCE | AMBL/DY18 | 214 | 6.90 | 10.00 | 60 | 201 | 1K | 18031.0 |
| | | | | uv/1.0 | | 12 | 12 | 1 | 120 |
| 13 | RIGHT HON12. Y FORCE | AMBL/DY18 | 215 | 7.96 | 10.00 | 60 | 201 | 1K | 19631.0 |
| | | | | uv/1.0 | | 13 | 13 | 1 | 120 |
| 14 | RIGHT HON12. X FORCE | AMBL/DY18 | 216 | 7.01 | 10.00 | 60 | 201 | 1K | 17591.0 |
| | | | | uv/1.0 | | 14 | 14 | 1 | 120 |

NOTES:
 1. SIGNALS FORWARDED TO ADAMS:
 6V P-P @ 75 Hz SINE WAVE
 0-3V P-P @ 100 Hz SQUARE WAVE
 COMPUTER START: -4 SECONDS
 5 VDC ADAM START: -2 SECONDS
 2. SIGNALS FORWARDED TO ADAMS:
 SHOULDER LOAD CELL CLIVIS
 115° AND 90° CLIVIS WITH BOLT
 90° CLIVIS WITH EXTENSION
 ADAMS SUPPORT PLATE
 SMALL ADAM
 3. WEIGHTS:
 POOR PLATE PLATE BARWARE 9.1
 SEAT BACK PLATE SEAT PAN 1.018
 SEAT PLATE (INCLUDES BOLTS) 234.0
 ADAMS SUPPORT PLATE 52.0
 SMALL ADAM 14.718
 4. LIGHTER CANTER WEIGHT 10.18

TABLE A-1a: INSTRUMENTATION REQUIREMENTS (+6g ACCELERATION CONFIGURATION)

| DIGITAL INSTRUMENTATION REQUIREMENTS | | | | | | | | | | | |
|--|-----------------|------------|---------------|---------|---------|---------|---------|-------------|-------------|----------|----------------------|
| DYNACORP PROGRAM: MANNING, AGV (CHIA) - D3038 | | | | | | | | | | | |
| CRASH MONITORING IMPACT & ANTROPOLOGIC | | | | | | | | | | | |
| DATE 02 NOV86 - THRU 12 NOV 86 | | | | | | | | | | | |
| FACILITY/HORIZONTAL ACCELERATOR | | | | | | | | | | | THRU 3197 |
| RUN | 3484 | 3485 | 3486 | 3487 | 3488 | 3489 | 3490 | 3491 | 3492 | 3493 | 3494 |
| DATA CHANNEL | DATA POINT | REDUCER | REDUCER | REDUCER | REDUCER | REDUCER | REDUCER | REDUCER | REDUCER | REDUCER | SPECIAL NOTATIONS |
| | | NRG & TYPE | SERIAL NUMBER | WHEELS | WHEELS | AMP | AMP | SAMPLE RATE | FILTER | NRG ZERO | NRG BALANCE |
| | | AMBL/DYI | 201 | 7.39 | 10.00 | 60 | 201 | 1K | 1.6831.8 | 120 | 2.5 19K •IN QRD. |
| 15 | RIGHT. 3D-SV | AMBL/DYI | 201 | uv/Lb | 15 | 15 | 10 | 1 | | 1.45.0 | - |
| 16 | RIGHT. 3D-FORCE | AMBL/DYI | 211 | 5.11 | 10.00 | 60 | 102 | 1K | 1.2171.8 | 120 | 2.5 19K •IN QRD. |
| 17 | RIGHT. 3D-SV | AMBL/DYI | 211 | uv/Lb | 16 | 16 | 4 | 1 | | 1.45.0 | - |
| 18 | RIGHT. 3D-FORCE | AMBL/DYI | 212 | 6.12 | 10.00 | 60 | 201 | 1K | 1.2721.8 | 120 | 2.5 67K •IN QRD. |
| 19 | RIGHT. 3D-SV | AMBL/DYI | 212 | uv/Lb | 18 | 18 | 12 | 1 | | 1.45.0 | - |
| 20 | RIGHT. 3D-FORCE | AMBL/DYI | 212 | 6.89 | 10.00 | 60 | 201 | 1K | 1.0051.8 | 120 | 2.5 19K •IN QRD. |
| 21 | RIGHT. 3D-SV | AMBL/DYI | 212 | uv/Lb | 19 | 19 | 4 | 1 | | 1.45.0 | - |
| 22 | RIGHT. 3D-FORCE | AMBL/DYI | 212 | 7.21 | 10.00 | 60 | 201 | 1K | 1.1291.8 | 120 | 2.5 63K •IN QRD. |
| 23 | RIGHT. 3D-SV | AMBL/DYI | 212 | uv/Lb | 20 | 20 | 13 | 1 | | 1.45.0 | - |
| 24 | RIGHT. 3D-FORCE | AMBL/DYI | 212 | 7.77 | 10.00 | 60 | 100 | 1K | 1.3211.8 | 120 | 2.5 50K •IN QRD. |
| 25 | RIGHT. 3D-SV | AMBL/DYI | 301 | uv/Lb | 21 | 21 | 30 | 1 | | 1.45.0 | - |
| 26 | RIGHT. 3D-FORCE | AMBL/DYI | 301 | 7.00 | 10.00 | 60 | 201 | 1K | 1.1771.8 | 120 | 2.5 0.5K |
| 27 | RIGHT. 3D-SV | AMBL/DYI | 301 | uv/Lb | 22 | 22 | 16 | 1 | | 1.45.0 | - |
| 28 | RIGHT. 3D-FORCE | AMBL/DYI | 301 | 6.68 | 10.00 | 60 | 102 | 1K | 1.3111.8 | 120 | 2.5 0.5K |
| 29 | RIGHT. 3D-SV | AMBL/DYI | 301 | uv/Lb | 23 | 23 | 5 | 1 | | 1.45.0 | - |
| 30 | RIGHT. 3D-FORCE | AMBL/DYI | 301 | 6.55 | 10.00 | 60 | 201 | 1K | 1.2731.81.8 | 120 | 2.5 0.5K |
| 31 | RIGHT. 3D-SV | AMBL/DYI | 301 | uv/Lb | 24 | 24 | 1 | 1 | | 1.45.0 | - |
| 32 | RIGHT. 3D-FORCE | AMBL/DYI | 301 | 10.19 | 10.00 | 60 | 102 | 1K | 1.3111.8 | 120 | 2.5 0.5K |
| 33 | RIGHT. 3D-SV | AMBL/DYI | 301 | uv/Lb | 25 | 25 | 1 | 1 | | 1.45.0 | - |
| 34 | RIGHT. 3D-FORCE | AMBL/DYI | 301 | 10.19 | 10.00 | 60 | 201 | 1K | 1.2731.81.8 | 120 | 2.5 0.5K |
| 35 | RIGHT. 3D-SV | AMBL/DYI | 301 | uv/Lb | 26 | 26 | 1 | 1 | | 1.45.0 | - |
| 36 | RIGHT. 3D-FORCE | AMBL/DYI | 301 | 10.0 | 10.00 | 60 | 102 | 1K | 1.3111.8 | 120 | 2.5 0.5K |
| 37 | RIGHT. 3D-SV | AMBL/DYI | 301 | uv/Lb | 27 | 27 | 1 | 1 | | 1.45.0 | - |
| 38 | RIGHT. 3D-FORCE | AMBL/DYI | 301 | 2.817 | 10.00 | 60 | 50 | 1K | 1.17.10 | 120 | 2.5 160K •IN QRD. |
| 39 | RIGHT. 3D-SV | AMBL/DYI | 301 | uv/Lb | 28 | 27 | 2 | 1 | | 1.45.0 | - |
| 40 | RIGHT. 3D-FORCE | AMBL/DYI | 301 | 2.962 | 10.00 | 60 | 25 | 1K | 1.33.80 | 120 | 2.5 1.5M |
| 41 | RIGHT. 3D-SV | AMBL/DYI | 301 | uv/Lb | 28 | 26 | 11 | 1 | | 1.45.0 | - |

TABLE A-1b: INSTRUMENTATION REQUIREMENTS (+GY ACCELERATION CONFIGURATION)

DIGITAL INSTRUMENTATION REQUIREMENTS

CREST HORIZONTAL IMPACT OF AUTOPSYNTHETIC
PROGRAM MARKERS (CHIA) TESTS

FACILITY HORIZONTAL ACCELERATOR

BURN

THRU

3100

THRU

3107

DYNCORP

| DATA CHANNEL | DATA POINT | OUTPUT TYPE | SERIAL NUMBER | INPUT SIGNALS | OUTPUT V. CRD | AMP GAIN | SUPPLY V. IN | PULL UP RESIST. | OUTPUT SIGNALS | INDUCED SIGNALS | BALANCE | INDUCE COMP. RESIST. | SPECIAL NOTATIONS | |
|--------------|---------------------------|-------------|----------------------------|-------------------------|---------------|----------|--------------|-----------------|----------------|-----------------|---------|----------------------|---|---|
| 29 | SHOOTBACK | ENDIVCO | B1317 | 2.754 mV/0 | 10.00 | 60 | 25 | 1K | 36.30 | 120 | 2.5 | 110K | 1.5K | |
| 30 | *INTERNAL TDR. | - | - | 10.0 mV/0.5C | - | 60 | 1 | 1K | 250K | 120 | 0.0 | 45.0 | -1100 GND. + REP. TO GND. - 1 VIDE ONLY | |
| 31 | *HEAD X ACCEL. | ENDIV | 104061- V11-11 | 2.53 mV/0 | - | 60 | 5 | 1K | 197.60 | 120 | 2.5 | 45.0 | - | |
| 32 | *HEAD Y ACCEL. | ENDIV | 104061- V21-26 | 2.44 mV/0 | - | 60 | 5 | 1K | 204.90 | 120 | 2.5 | 45.0 | - | |
| 33 | *CHAS X ACCEL. | ENDIV | 211061- ST-7 | 2.46 mV/0 | - | 60 | 5 | 1K | 203.30 | 120 | 2.5 | 45.0 | - | |
| 34 | *CHAS Y ACCEL. | ENDIV | 211061- ST-000 | 3.239 mV/0 | 10.00 | 60 | 5 | 1K | 195.30 | 120 | 2.5 | 45.0 | - | |
| 35 | CHAS Y ACCEL. | ENDIVCO | 104061 | 3.256 mV/0 | 10.00 | 60 | 10 | 1K | 16.60 | 120 | 2.5 | 45.0 | - | |
| 36 | CHAS Y ACCEL. | ENDIVCO | 104061H | 3.010 mV/0 | 10.00 | 60 | 10 | 1K | 63.10 | 120 | 2.5 | 45.0 | - | |
| 37 | REFERENCE MARK | - | - | 1.0 VOLTS | - | 1000 | 2.5 | 1K | 1 | 2.5 | 5.0 | 0.0 | - | |
| 38 | *HEAD ANOMAL BY | ENDIVCO | A115 | 6.54 mV/AD1/ S1C2 | 10.00 | 60 | 100 | 1K | 3623 | 120 | 2.5 | 45.0 | 260K +10 GND. - | |
| 39 | *HEAD/ NECK X FORCE | DYNTRON | 01217 | h-4.1 mV/1.0 | - | 60 | 402 | 1K | 11041.1 | 120 | 2.5 | 45.0 | - | |
| 40 | *HEAD/ NECK Y FORCE | DYNTRON | 01217 | 2.43 mV/1.0 | - | 60 | 201 | 1K | 13161.1 | 120 | 2.5 | 45.0 | - | |
| 41 | *DYNBAR Y FORCE | DENTON | 040 | 6.30 mV/1.0 | - | 60 | 201 | 1K | 1 | 1974.1 | 120 | 2.5 | 45.0 | - |
| 42 | *DYNBAR Y ACCEL. | ENDIV | 104061- V10-16 -1000 | 2.58 mV/0 | - | 60 | 10 | 1K | 56.90 | 120 | 2.5 | 45.0 | - | |

• SMALL ADAM TRANSDUCERS

Page 1 of 4

TABLE A-1c: INSTRUMENTATION REQUIREMENTS (+GY ACCELERATION CONFIGURATION)

| DIGITAL INSTRUMENTATION REQUIREMENTS | | | | | | | | | | | |
|--|------------|--------------------|-------------------------------|---------------|-----------|-----------|-----------|-----------|-----------|-------|---------------------------------|
| CREST HORIZONTAL IMPACT OF AIRBORNE/PORONIC PROGRAM MULTIPLE, POL. (OMAL) TESTS | | | DATE 28 NOV 88 THRU 22 DEC 88 | | | THRU 3527 | | | THRU 3527 | | |
| FACILITY HORIZONTAL ACCELERATOR | | | RUN 3138 | | | RUN 3527 | | | | | |
| DATA CHANNEL | DATA POINT | SERIAL NUMBER | ACCELERATOR | DATA | AMPLIFIER | FILTER | AMPLIFIER | AMPLIFIER | SHOCK | SHOCK | SPECIAL NOTATIONS |
| | | | | V | AMP | STATUS | AMP | AMP | SHOCK | SHOCK | |
| | | | | CHAN | CHAN | CHAN | CHAN | CHAN | CHAN | CHAN | |
| 1 | SLID 1 | ENDEVCO 2262A-200 | ENDEVCO 2264-200 | 5-013 uv/G | 10.00 | 60 | 10 | 1X | 19.90 | 120 | 2.5 +5.0 0.0 |
| 2 | SLID 2 | ENDEVCO 2264-200 | ENDEVCO 2264-200 | 3-116 uv/G | 10.00 | 60 | 50 | 1X | 15.90 | 120 | 2.5 +5.0 0.0 |
| 3 | SLID 3 | ENDEVCO 2264-200 | ENDEVCO 2264-200 | 2-902 uv/G | 10.00 | 60 | 50 | 1X | 17.20 | 120 | 2.5 +5.0 +IN GND. 1.5K |
| 4 | LEFT | CH 252 3D-SW | CH 252 3D-SW | 6-33 uv/LB | 10.00 | 60 | 100 | 1X | 394.90 | 120 | 2.5 +5.0 0.0 +IN GND. |
| 5 | LEFT | CH 157 3D-SW | CH 157 3D-SW | 5-40 uv/LB | 10.00 | 60 | 102 | 1X | 1152.0 | 120 | 2.5 +5.0 0.0 |
| 6 | LEFT | CH 152 3D-SW | CH 152 3D-SW | 5-42 uv/LB | 10.00 | 60 | 102 | 1X | 1187.0 | 120 | 2.5 +5.0 0.0 |
| 7 | RIGHT | CH 202 3D-SW | CH 202 3D-SW | 6-29 uv/LB | 10.00 | 60 | 100 | 1X | 3975.0 | 120 | 2.5 +5.0 0.0 -IN GND. |
| 8 | RIGHT | CH 203 3D-SW | CH 203 3D-SW | 6-32 uv/LB | 10.00 | 60 | 102 | 1X | 1169.0 | 120 | 2.5 +5.0 0.0 +IN GND. |
| 9 | RIGHT | CH 204 3D-SW | CH 204 3D-SW | 6-90 uv/LB | 10.00 | 60 | 102 | 1X | 1269.0 | 120 | 2.5 +5.0 0.0 +IN GND. |
| 10 | LEFT | AAIRL/DYN 3D-SW | AAIRL/DYN 3D-SW | 1-96 uv/LB | 10.00 | 60 | 50 | 1X | 6201.0 | 120 | 2.5 +5.0 0.0 |
| 11 | LEFT | AAIRL/DYN 3D-SW | AAIRL/DYN 3D-SW | 1-15 uv/LB | 10.00 | 60 | 100 | 1X | 3497.0 | 120 | 2.5 +5.0 0.0 +IN GND. |
| 12 | LEFT | AAIRL/DYN 3D-SW | AAIRL/DYN 3D-SW | 6-90 uv/LB | 10.00 | 60 | 100 | 1X | 3623.0 | 120 | 2.5 +5.0 0.0 +IN GND. |
| 13 | RIGHT | AAIRL/DYN 3D-SW | AAIRL/DYN 3D-SW | 1-96 uv/LB | 10.00 | 50 | 12 | 1X | 6201.0 | 120 | 2.5 +5.0 0.0 +IN GND. |
| 14 | RIGHT | AAIRL/DYN 3D-SW | AAIRL/DYN 3D-SW | 1-97 uv/LB | 10.00 | 60 | 100 | 1X | 3536.0 | 120 | 2.5 +5.0 0.0 |

MASTER STATION COMPARATORS:
6 V P-P 0.15 MS SIN WAVE
0-3 V P-P 0.100 MS SQUARE WAVE
SIGNALS FURNISHED TO ADAM:
SHOULDER LOAD CELL, CLAVIS 1.5LB
SEAT BACK PLIUS SEAT PAN 1.7LB
XLS & 90° CLAVIS WITH MOLT 1.0LB
300° CLAVIS WITH EXTENSION 3.0LB
ADAMS SUPPORT PLATE 10.0LB
SMALL ADAM 14.3LB
ORIGIN CAMERAS MOUNT 39LB
DATA 1 OF 5

TABLE A-2a: INSTRUMENTATION REQUIREMENTS (-6g ACCELERATION CONFIGURATION)

DIGITAL INSTRUMENTATION REQUIREMENTS
PROGRAM: HORIZONTAL IMPACT OF ANTHROPOMORPHIC (CHIA) TESTS

DATE: 28 NOV 86 FNUU 22 DEC 86

THRU 3127

RUN 3126

THRU 3127

FACILITY: HORIZONTAL ACCELERATOR

| DATA CHANNEL | DATA POINT | INPUTS | INPUTS | REDUCER | REDUCER | V CHAN | FILTRATE | AMP | SAMPLE | FULL | FILTER | INDUCER | BALANCE | BALANCE | BALANCE | BALANCE | BALANCE | SPECIAL NOTATIONS | | |
|--------------|---------------------------|------------|--------|---------|---------|--------|----------|-----|--------|---------|--------|---------|---------|----------|----------|---------|---------|-------------------|--|--|
| | | | | | | | | | | | | | | | | | | | | |
| 15 | RIGHT ARM/ 3D-SV | AAABL/ DTB | 214 | 1.39 | 10.00 | 60 | 100 | 1K | 1K | 33031.0 | 120 | 2.5 | 1.9K | | | | | | | |
| 16 | LEFT ARM/ 3D-SV | GM | 213 | 5.11 | 10.00 | 15 | 15 | 31 | 1K | 21341.0 | 120 | 2.5 | 1.5K | +1K GRD. | | | | | | |
| 17 | RIGHT VERT/ 3D-SV | DTB | 211 | | | uv/lb | | | 16 | 10 | 1 | | | | | | | | | |
| 18 | LEFT VERT/ 3D-SV | GM | 212 | | | uv/lb | | | 16 | 10 | 1 | | | | | | | | | |
| 19 | RIGHT VERT/ 3D-SV | AAABL/ DTB | 231 | 6.89 | 10.00 | 60 | 100 | 1K | 1K | 12712.0 | 120 | 2.5 | 9.1K | | | | | | | |
| 20 | RIGHT VERT/ 3D-SV | AAABL/ DTB | 231 | 7.21 | 10.00 | 60 | 100 | 1K | 1K | 40051.0 | 120 | 2.5 | 1.5K | +1K GRD. | | | | | | |
| 21 | RIGHT VERT/ 3D-SV | AAABL/ DTB | 232 | 7.77 | 10.00 | 60 | 100 | 1K | 1K | 36261.0 | 120 | 2.5 | 15.0 | - | | | | | | |
| 22 | RIGHT 3D-SV | AAABL/DTB | 301 | 7.00 | 10.00 | 60 | 201 | 1K | 1K | 17251.0 | 120 | 2.5 | 6.3K | - | | | | | | |
| 23 | SHOULDER 3D-SV | AAABL/DTB | 302 | 6.60 | 10.00 | 60 | 100 | 1K | 1K | 32161.0 | 120 | 2.5 | 15.0 | 10K | | | | | | |
| 24 | SHOULDER 3D-SV | AAABL/DTB | 303 | 5.55 | 10.00 | 60 | 201 | 1K | 1K | 17771.0 | 120 | 2.5 | 15.0 | - | 0.3K | | | | | |
| 25 | SHOULDER 3D-SV | AAABL/DTB | 304 | | | uv/lb | | | 22 | 16 | 1 | | | | | | | | | |
| 26 | SHOULDER 3D-SV | AAABL/DTB | 305 | | | uv/lb | | | 23 | 16 | 1 | | | | | | | | | |
| 27 | VELOCITY GLOBE | 2 | | 0.04034 | - | | 30 | 1 | 1K | 12.5 | 60 | 0.0 | 15.0 | - | 0.3K | | | | | |
| 28 | VELOCITY 22A672-2 | | | | | V/P/S | 25 | 1 | - | - | 1 | PF/SEC | 0.0 | 0.0 | | | | | | |
| 29 | RAM ENDENCO 22632-200 | | | | | uv/s | - | 60 | 1 | 1K | 1000 | 120 | 2.5 | 15.0 | - | | | | | |
| 30 | RAM ENDENCO 22632-200 | | | | | uv/s | 26 | 26 | - | 1 | 2734 | 120 | 2.5 | 15.0 | - | | | | | |
| 31 | RAM BACK ENDENCO 2264-200 | | | | | uv/s | 27 | 27 | 30 | 1K | 68.70 | 120 | 2.5 | 1.8K | +1K GRD. | | | | | |
| 32 | RAM BACK ENDENCO 2264-200 | | | | | uv/s | 28 | 28 | 11 | 1 | 33.80 | 120 | 2.5 | 15.0 | - | 1.54K | | | | |

TABLE A-2b: INSTRUMENTATION REQUIREMENTS (-G_x ACCELERATION CONFIGURATION)

DIGITAL INSTRUMENTATION REQUIREMENTS
 CRIST HORIZONTAL IMPACT OF ANTHROPOGRAPHIC
 PROGRAM ANALYSIS AND SCHAL TESTS

DATE 28 NOV 68 THRU 22 DEC 68

RUN 3498 THRU 3521

DYNCORP

| FACILITY | HORIZONTAL ACCELERATOR | DATA POINT | LOCATOR | SERIAL NUMBER | ADAPTER SENS. | ELECTR. V. CHAM | FILTER | AMP | SAMPLE RATE | FULL SCALE | FILTER B2 | RAD/SEC RANGE | RAD/SEC RESISTORS | SPECIAL NOTATIONS | | | |
|----------|------------------------|------------|----------------|---------------|---------------|-----------------|--------|-----|-------------|----------------|-----------|---------------|-------------------|-------------------|-------|-------|--|
| | | | | | | | | | | | | | | TYPE | SENS. | SENS. | |
| 29 | SEAT BACK | DYNCOV | 00117 | 2.154 av/G | 13.00 | 60 | 25 | 1K | 36.30 | 120 | 2.5 | 15.0 | 1.10K | | | | |
| | ACCEL. | | | | | 29 | 29 | 24 | 1 | | | 0.0 | 0.0 | | | | |
| 30 | PISTON/VAL | - | - | - | 10.0 av/G | 30 | 30 | 1K | | 250°C | 120 | 2.5 | 15.0 | | | | -1500 RAD.; REP. TO QMD. - 1 WIRE ONLY |
| | TEMP. | | | | | | | | | | | 0.0 | 0.0 | | | | |
| 31 | PILOT # | SHTRAM | 104661-0115-14 | 2.53 av/G | - | 60 | 5 | 1K | | 197.60 | 120 | 2.5 | 15.0 | | | | |
| | ACCEL. | | | | | 31 | 31 | 1K | 1 | | | 0.0 | 0.0 | | | | |
| 32 | HEAD # | SHTRAM | 104661-0115-15 | 2.52 av/G | - | 60 | 5 | 1K | | 1980 | 120 | 2.5 | 15.0 | | | | |
| | ACCEL. | | | | | 32 | 32 | 3K | 1 | | | 0.0 | 0.0 | | | | |
| 33 | CHEST # | SHTRAM | 104661-0115-16 | 2.41 av/G | - | 60 | 10 | 1K | | 103.70 | 120 | 2.5 | 15.0 | | | | |
| | ACCEL. | | | | | 33 | 33 | 20 | 1 | | | 0.0 | 0.0 | | | | |
| 34 | CHEST # | DYNCOV | 00168 | 3.219 av/G | 10.00 | 60 | 5 | 1K | | 155.30 | 120 | 2.5 | 15.0 | | | | |
| | ACCEL. | | | | | 34 | 34 | 6 | 1 | | | 0.0 | 0.0 | | | | 1.5K |
| 35 | CHEST # | DYNCOV | 000118 | 3.256 av/G | 10.00 | 60 | 10 | 1K | | 16.00 | 120 | 2.5 | 15.0 | | | | |
| | ACCEL. | | | | | 35 | 35 | 5 | 1 | | | 0.0 | 0.0 | | | | 1.5K |
| 36 | CHEST # | DYNCOV | 000118 | 3.010 av/G | 10.00 | 60 | 5 | 1K | | 1660 | 120 | 2.5 | 15.0 | | | | |
| | ACCEL. | | | | | 36 | 36 | 4 | 1 | | | 0.0 | 0.0 | | | | 1.5K |
| 37 | REPROD. | - | - | 1.0 VOLT | - | 1000 | 2.5 | 1K | | 2.5 | | 5.0 | 15.0 | | | | |
| | MARK | | | | | 37 | 13 | 7 | 1 | 2000 | | 0.0 | 0.0 | | | | |
| 38 | CHEST | DYNCOV | 00115 | 6.54 uv/MAU/ | 10.00 | 60 | 25 | 1K | | 15290 RAD/SEC2 | 120 | 2.5 | 15.0 | | | | 250K |
| | ANGULAR RV | | | | | 38 | 38 | 20 | 1 | | | 0.0 | 0.0 | | | | |
| 39 | DEPTOM | 01271 | 6.43 uv/LB | - | - | 60 | 102 | 1K | | 14CALB | 120 | 2.5 | 15.0 | | | | |
| | BECK # | | | | | 39 | 39 | 12 | 1 | | | 0.0 | 0.0 | | | | |
| 40 | HEAD/BLACK | DEPTOM | 01271 | 7.65 uv/LB | - | 60 | 201 | 1K | | 16261LB | 120 | 2.5 | 15.0 | | | | |
| | BLACK | | | | | 40 | 40 | 6 | 1 | | | 0.0 | 0.0 | | | | |
| 41 | OLDEMAN | DEPTOM | 0010 | 6.30 uv/LB | - | 60 | 50 | 1K | | 17971LB | 120 | 2.5 | 15.0 | | | | |
| | FORCE | | | | | 41 | 41 | 2 | 1 | | | 0.0 | 0.0 | | | | |
| 42 | OLDEMAN | SHTRAM | 21061-013-3 | 2.53 av/G | - | 60 | 10 | 1K | | 98.80 | 120 | 2.5 | 15.0 | | | | |
| | ACCEL. | | | | | 42 | 42 | 12 | 1 | | | 0.0 | 0.0 | | | | |

TABLE A-2c: INSTRUMENTATION REQUIREMENTS (-6X ACCELERATION CONFIGURATION)

| MANUFACTURER | MODEL | RANGE | SENSITIVITY (mV) | RESONANCE FREQ (Hz) | FREQUENCY RESPONSE (Hz.) | EXCITATION (Volt) | 2 ARM or 4 ARM | ADDITIONAL NOTES |
|--------------|-------------------|----------------------------------|-------------------------------|------------------------|-----------------------------|----------------------|-------------------|---|
| Endevco | 2262A-200 | ± 200 G | 2.5/G | 7000 | 0-2000 | 10 | 4 arm | Linear accelerometer .7 damping ratio |
| Endevco | 2264-200 | ± 200 G | 2.5/G | 4700 | 0-1200 | 10 | 2 arm | Linear accelerometer |
| Endevco | 7264-200 | ± 200 G | 2.5/G | 6000 | 0-1200 | 10 | 2 arm | Linear accelerometer, 1000 G overrange |
| Endevco | 7302A | ± 50,000 Rad/Sec ² | .055 /Rad/Sec ² | 2500 | 1-600 | 10 | 4 arm | Angular accelerometer, X10 overrange |
| Entran | EGA-125F- 1000 | ± 100 G | 2.5/G | 1500 | 0-800 | 15 | 4 arm | Linear accelerometer 500 G overrange .7 damping ratio |
| Denton | 1716 | ± 3000 LB | .0033/LB | N/A | N/A | 10 | 4 arm | 6 axis (i.e. 1 cell); 15 V max exc. |
| Denton | 1914 | ± 3,000 LB | .0017/LB | N/A | N/A | 10 | 4 arm | 6 axis load cell; 15 V max exc. |

TABLE A-3: TYPICAL TRANSDUCER SPECIFICATIONS

DYNCORP PROGRAM CALIBRATION LOG

CREST HORIZONTAL IMPACT OF ANTHROPOMORPHIC
PROGRAM MANIKINS -4G AND -GX (CHIA) TESTS DATES: 02 NOV 88 - 22 DEC 88
FACILITY HORIZONTAL ACCELERATOR RUN NUMBERS: 3484 - 3527

| DATA POINT | TRANSDUCER MPC-6 MODEL | SERIAL NUMBER | PRE-CAL | | POST-CAL | | XCHANGE | NOTES |
|---------------------------|---------------------------|------------------|---------|---------------|----------|---------------|---------|-------|
| | | | DATE | SENS | DATE | SENS | | |
| SLED Y | ENDEVCO 2262A-200 | FR31 | 27OCT88 | 5.013 mv/G | 06JAN89 | 5.030 | +.3 | |
| SLED X | ENDEVCO 2264-200 | BQ47 | 27OCT88 | 3.146 mv/G | 06JAN89 | 3.156 mv/G | +.3 | |
| SLED Z | ENDEVCO 2264-200 | BN61 | 27OCT88 | 2.902 mv/G | 06JAN89 | 2.895 mv/G | -.2 | |
| LEFT SHOULDER X FORCE | GM 3D-SW | 15Z | 25OCT88 | 6.33 uv/LB | 05JAN89 | 6.36 uv/LB | +.5 | |
| LEFT SHOULDER Y FORCE | GM 3D-SW | 15Y | 25OCT88 | 5.40 uv/LB | 05JAN89 | 5.40 uv/LB | 0 | |
| LEFT SHOULDER Z FORCE | GM 3D-SW | 15X | 25OCT88 | 5.42 uv/LB | 05JAN89 | 5.43 uv/LB | +.2 | |
| RIGHT SHOULDER X FORCE | GM/DYN 3D-SW | 20Z | 25OCT88 | 6.29 uv/LB | 05JAN89 | 6.35 uv/LB | +.0 | |
| RIGHT SHOULDER Y FORCE | GM/DYN 3D-SW | 20Y | 25OCT88 | 5.32 uv/LB | 05JAN89 | 5.37 uv/LB | +.9 | |
| RIGHT SHOULDER Z FORCE | GM/DYN 3D-SW | 20X | 25OCT88 | 4.90 uv/LB | 05JAN89 | 4.94 uv/LB | +.8 | |
| LEFT HORIZ. X FORCE | GM/DYN 3D-SW | 23Z | 25OCT88 | 7.96 uv/LB | 04JAN89 | 7.91 uv/LB | -.6 | |

DYNCORP PROGRAM CALIBRATION LOG

CREST HORIZONTAL IMPACT OF ANTHROPOMORPHIC
PROGRAM HAWKINS +Gy AND -Gx (CHIA) TESTS
FACILITY HORIZONTAL ACCELERATOR

RUN NUMBERS: 3484 - 3527

| DATA POINT | TRANSDUCER MPC & MODEL | SERIAL NUMBER | PRE-CAL | POST-CAL | CHANGE | NOTES |
|---------------------------|---------------------------|------------------|---------|---------------|------------------|--------------|
| | | | | | | |
| LEFT HORIZ. Y FORCE | AAMRL/DYN 3D-SW | 23Y | 25OCT88 | 7.15 uv/LB | 04JAN89 uv/LB | 7.15 0 |
| LEFT HORIZ. Z FORCE | AAMRL/DYN 3D-SW | 23X | 25OCT88 | 6.90 uv/LB | 04JAN89 uv/LB | 6.92 +.3 |
| RIGHT HORIZ. X FORCE | AAMRL/DYN 3D-SW | 24Z | 25OCT88 | 7.96 uv/LB | 05JAN89 uv/LB | 7.88 -1.0 |
| RIGHT HORIZ. Y FORCE | AAMRL/DYN 3D-SW | 24Y | 25OCT88 | 7.07 uv/LB | 05JAN89 uv/LB | 7.06 -.1 |
| RIGHT HORIZ. Z FORCE | AAMRL/DYN 3D-SW | 24X | 25OCT88 | 7.39 uv/LB | 05JAN89 uv/LB | 7.40 +.1 |
| LEFT VERTICAL X FORCE | GM 3D-SW | 21X | 26OCT88 | 5.11 uv/LB | 04JAN89 uv/LB | 5.13 +.4 |
| LEFT VERTICAL Y FORCE | GM 3D-SW | 21Y | 26OCT88 | 4.89 uv/LB | 04JAN89 uv/LB | 4.87 -.4 |
| LEFT VERTICAL Z FORCE | GM 3D-SW | 21Z | 26OCT88 | 6.12 uv/LB | 04JAN89 uv/LB | 6.18 +.0 |
| RIGHT VERTICAL X FORCE | AAMRL/DYN 3D-SW | 25X | 26OCT88 | 6.89 uv/LB | 06JAN89 uv/LB | 6.94 +.7 |
| RIGHT VERTICAL Y FORCE | AAMRL/DYN 3D-SW | 25Y | 26OCT88 | 7.21 uv/LB | 06JAN89 uv/LB | 7.27 +.8 |

DYNCORP PROGRAM CALIBRATION LOG

CREST HORIZONTAL IMPACT OF ANTHROPOMORPHIC
 PROGRAM MANIKINS +GX AND -GX (CHIA) TESTS DATES: 02 NOV 88 - 22 DEC 88
 FACILITY HORIZONTAL ACCELERATOR RUN NUMBERS: 3484 - 3527

| DATA POINT | TRANSDUCER MPC & MODEL | SERIAL NUMBER | PRE-CAL | | POST-CAL | | NOTES |
|-----------------------------|------------------------------|------------------|---------|----------------------|----------|----------------------|-------|
| | | | DATE | SENS | DATE | SENS | |
| RIGHT VERTICAL z FORCE | AAMRL/DYN 3D-SW | 25Z | 26OCT88 | 7.77 uv/LB | 06JAN89 | 7.80 uv/LB | +.4 |
| SHOULDER ROLLERS y | AAMRL/DYN EA-06-125BZ-350 | 30Y | 24OCT88 | 7.00 uv/LB | 04JAN89 | 7.15 uv/LB | +2.1 |
| SHOULDER ROLLERS z | AAMRL/DYN EA-06-125BZ-350 | 30Z | 24OCT88 | 6.68 uv/LB | 04JAN89 | 6.87 uv/LB | +2.8 |
| SHOULDER ROLLERS Mx | AAMRL/DYN EA-06-125BZ-350 | 30Mx | 24OCT88 | 4.55 uv/ In-LB | 04JAN89 | 4.54 uv/ In-LB | -.2 |
| VELOCITY | GLOBE 22A672-2 | 2 | 05JAN88 | .04034 V/F/S | — | — | — |
| RAM ACCELERATION | ENDEVCO 2262A-200 | HM75 | 27APR88 | 3.339 mV/G | 06JAN89 | 3.328 mV/G | -.3 |
| SEAT BACK x ACCELERATION | ENDEVCO 2264-200 | BW07 | 27OCT88 | 2.817 mV/G | 05JAN89 | 2.815 mV/G | -.1 |
| SEAT BACK y ACCELERATION | ENDEVCO 2264-200 | BV95 | 27OCT88 | 2.962 mV/G | 05JAN89 | 2.967 mV/G | +.1 |
| SEAT BACK z ACCELERATION | ENDEVCO 2264-200 | BX17 | 27OCT88 | 2.754 mV/G | 05JAN89 | 2.772 mV/G | +.6 |

TABLE A-4c: TRANSDUCER PRE- AND POST-CALIBRATION (PAGE 3 OF 7)

DYNCORP PROGRAM CALIBRATION LOG

CREST HORIZONTAL IMPACT OF ANTHROPOMORPHIC
PROGRAM MANKINS +GY AND -GX (CHIA) TESTS DATES: 02 NOV 88 - 22 DEC 88
FACILITY HORIZONTAL ACCELERATOR RUN NUMBER: 3404 - 3527

| DATA POINT | TRANSDUCER MFG. & MODEL | SERIAL NUMBER | PRE-CAL | | POST-CAL | | XCHANGE | NOTES |
|-------------------------|----------------------------|------------------|---------|-------------------------|----------|-------------------------|---------|-------|
| | | | DATE | SENS | DATE | SENS | | |
| CHEST X ACCELERATION | ENDEVCO 7264-200 | BH76H | 27OCT88 | 3.219 mv/G | 01JAN89 | 3.219 mv/G | 0 | |
| CHEST Y ACCELERATION | ENDEVCO 7264-200 | BH81H | 27OCT88 | 3.256 mv/G | 03JAN89 | 3.252 mv/G | -.1 | |
| CHEST Z ACCELERATION | ENDEVCO 7264-200 | BH87H | 27OCT88 | 3.010 mv/G | 01JAN89 | 3.006 mv/G | -.1 | |
| CHEST ANGULAR RY | ENDEVCO 7302A | AB15 | 27OCT88 | 6.54 uv/RAD/ SEC2 | 09JAN89 | 6.46 uv/RAD/ SEC2 | -1.2 | |

TABLE A-4d: TRANSDUCER PRE- AND POST-CALIBRATION (PAGE 4 OF 7)

DYNACORP PROGRAM CALIBRATION LOG

CREST HORIZONTAL IMPACT OF ANTHROPOMORPHIC
PROGRAM MANIKIN -GX AND -Gx (CHJA) TESTS DATES: 02 NOV 88 - 22 DEC 88
FACILITY HORIZONTAL ACCELERATOR RUN NUMBER: 3484 - 3527

| DATA POINT | TRANSDUCER MFG. & MODEL | SERIAL NUMBER | PRE-CAL | | POST-CAL | | NOTES |
|--------------------------|----------------------------|------------------|---------|------|----------|------|-------|
| | | | DATE | SENS | DATE | SENS | |
| HEAD/NECK z FORCE | DENTON 1716 | 0127 | | 4.43 | | | |
| HEAD/NECK x FORCE | DENTON 1716 | 0127 | | 7.65 | | | |
| LUMBAR x FORCE | DENTON 1914 | 040 | | 6.30 | | | |
| LUMBAR x ACCELERATION | ENTRAN EGA-125F-100D | 21W6 X-E3-3 | | 2.53 | | | |
| NECK MY TORQUE | DENTON 1716 | 0127 | | 6.44 | | | |
| HEAD z ACCELERATION | ENTRAN EGA-125F-100D | 18W6W- V14-14 | | 2.53 | | | |
| HEAD x ACCELERATION | ENTRAN EGA-125F-100D | 18W6W- V15-15 | | 2.52 | | | |
| CHEST x ACCELERATION | ENTRAN EGA-125F-100D | 18W6W- VT-7 | | 2.41 | | | |
| HEAD y ACCELERATION | ENTRAN EGA-125F-100D | 18W6W- V24-24 | | 2.44 | | | |
| CHEST y ACCELERATION | ENTRAN EGA-125F-100D | 21W6X- ET-7 | | 2.46 | | | |

ALL TRANSDUCERS ON
THIS PAGE WERE
LOCATED ON THE
SMALL ADAM.
PRE- AND POST-
CALIBRATIONS ARE
CONTRACTOR SRL'S
RESPONSIBILITY.

TABLE A-4e: TRANSDUCER PRE- AND POST-CALIBRATION (PAGE 5 OF 7)

DYNCORP PROGRAM CALIBRATION LOG

CREST HORIZONTAL IMPACT OF ANTHROPOMORPHIC

PROGRAM MANIKINS *GY AND -GX (CHIA) TESTS

DATES: 02 NOV 88 - 22 DEC 88

FACILITY HORIZONTAL ACCELERATOR

RUN NUMBERS: 3484 - 3527

| DATA POINT | TRANSDUCER MPG. & MODEL | SERIAL NUMBER | PRE-CAL | | POST-CAL | | XCHANGE | NOTES |
|---------------------------|-------------------------|------------------|---------|---------------|----------|------|---------|---|
| | | | DATE | SENS | DATE | SENS | | |
| *HEAD/NECK Y FORCE | DENTON 1716 | 0127 | | 9.45 uv/LB | | | | *ALL DATA POINTS ARE SMALL ADAM |
| *LUMBAR Y FORCE | DENTON 1914 | 040 | | 6.30 uv/LB | | | | |
| *LUMBAR Y ACCELERATION | ENTRAN EGA-125F-100D | 18W6W- V18-18 | | 2.58 mv/G | | | | |
| **HEAD Z ACCELERATION | ENTRAN EGA-125F-100D | 12T6T- V11-11 | | 2.18 mv/G | | | | *ALL DATA POINTS ARE LARGE ADAM |
| **HEAD Y ACCELERATION | ENTRAN EGA-125F-100D | 12T6T- V9-9 | | 2.72 mv/G | | | | |
| **CHEST Y ACCELERATION | ENTRAN EGA-125F-100D | 18W6W- V9-9 | | 2.73 mv/G | | | | |
| **HEAD/NECK Z FORCE | DENTON 1716 | 0128 | | 4.53 uv/LB | | | | ALL TRANSDUCERS ON THIS PAGE WERE LOCATED ON ADAM MANIKINS. PRE- AND POST-CALIBRATIONS ARE CONTRACTOR SRL'S RESPONSIBILITY. |
| **HEAD/NECK Y FORCE | DENTON 1716 | 0128 | | 7.90 uv/LB | | | | |
| **LUMBAR Y Y FORCE | DENTON 1914 | 041 | | 6.30 uv/LB | | | | |

TABLE A-4f: TRANSDUCER PRE- AND POST-CALIBRATION (PAGE 6 OF 7)

DYNCORP PROGRAM CALIBRATION LOG

CREST HORIZONTAL IMPACT OF ANTHROPOMORPHIC
PROGRAM MANIKINS +GY AND -GX (CHLA) TESTS DATES: 02 NOV 88 - 22 DEC 88
FACILITY HORIZONTAL ACCELERATOR RUN NUMBERS: 3484 - 3527

| DATA POINT | TRANSDUCER MFG. & MODEL | SERIAL NUMBER | PRE-CAL | | POST-CAL | | NOTES |
|--|----------------------------|------------------|---------|------|----------------------|------|-------|
| | | | DATE | SENS | DATE | SENS | |
| **LUMBAR Y ACCELERATION | ENTRAN EGA-125F-100D | 18W6W- V20-20 | | | 2.30 mV/G | | |
| **HEAD X ACCELERATION | ENTRAN EGA-125F-100D | 12T6T- V4-4 | | | 2.48 mV/G | | |
| **CHEST X ACCELERATION | ENTRAN EGA-125F-100D | 15W6W- E19-19 | | | 2.59 mV/G | | |
| **HEAD/NECK X FORCE | DENTON 1716 | 0128 | | | 7.65 uv/LB | | |
| **LUMBAR X FORCE | DENTON 1914 | 041 | | | 6.20 uv/LB | | |
| **LUMBAR X ACCELERATION | ENTRAN EGA-125F-100D | 18W6W- V6-6 | | | 2.50 mV/G | | |
| **NECK MY TORQUE | DENTON 1716 | 0128 | | | 6.14 uv/ in-LB | | |
| ALL TRANSDUCERS ON THIS PAGE WERE LOCATED ON THE LARGE ADAM. PRE- AND POST- CALIBRATIONS ARE CONTRACTOR SRL'S RESPONSIBILITY. | | | | | | | |

TABLE A-4g: TRANSDUCER PRE- AND POST-CALIBRATION (PAGE 7 OF 7)

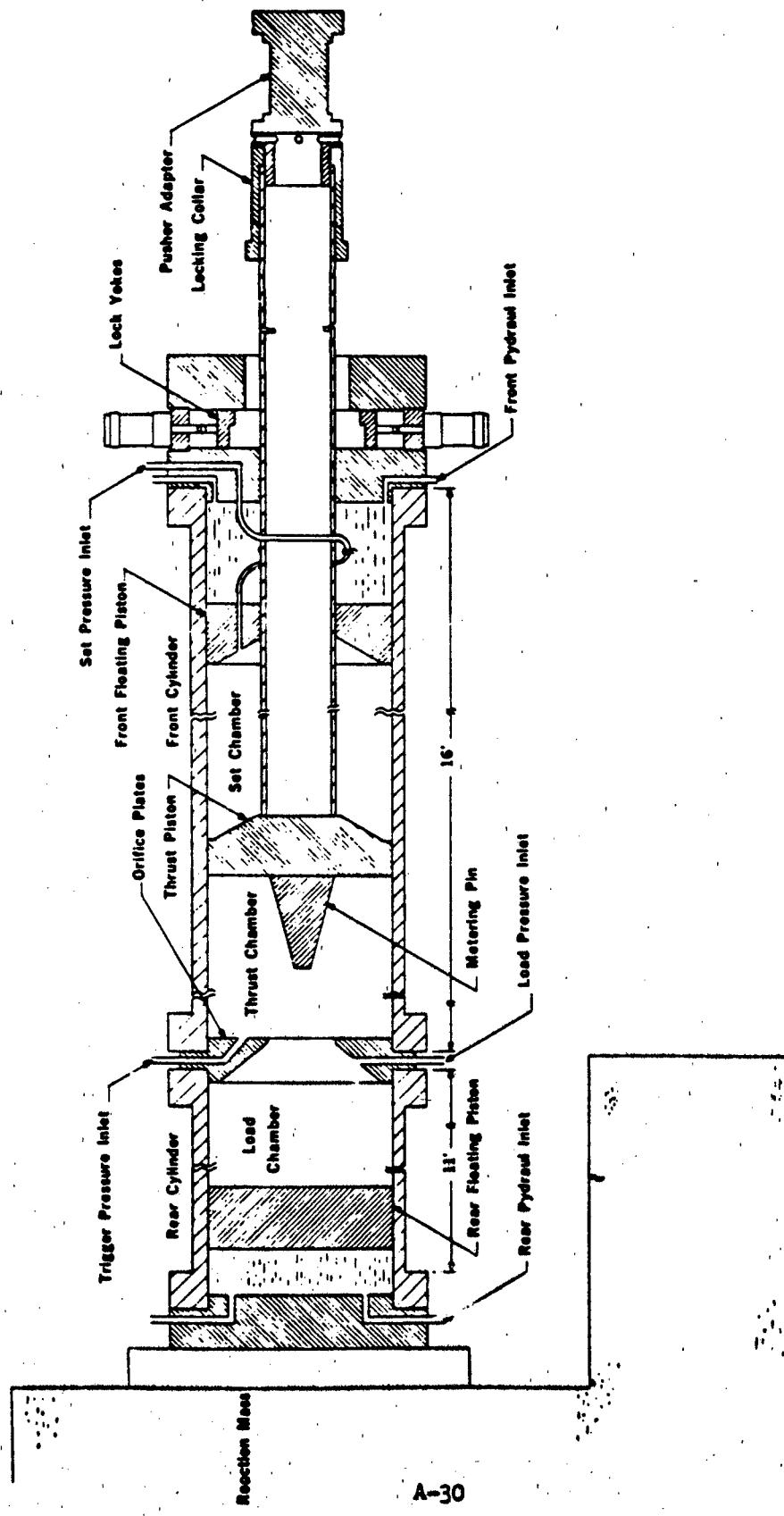


FIGURE A-1: HORIZONTAL ACCELERATOR ACTUATOR



FIGURE A-2: -6x CONFIGURATION SEAT FIXTURE

FRONT
OBLIQUE
CAMERA



FIGURE A-3: +6y CONFIGURATION SEAT FIXTURE/CAMERA LOCATIONS

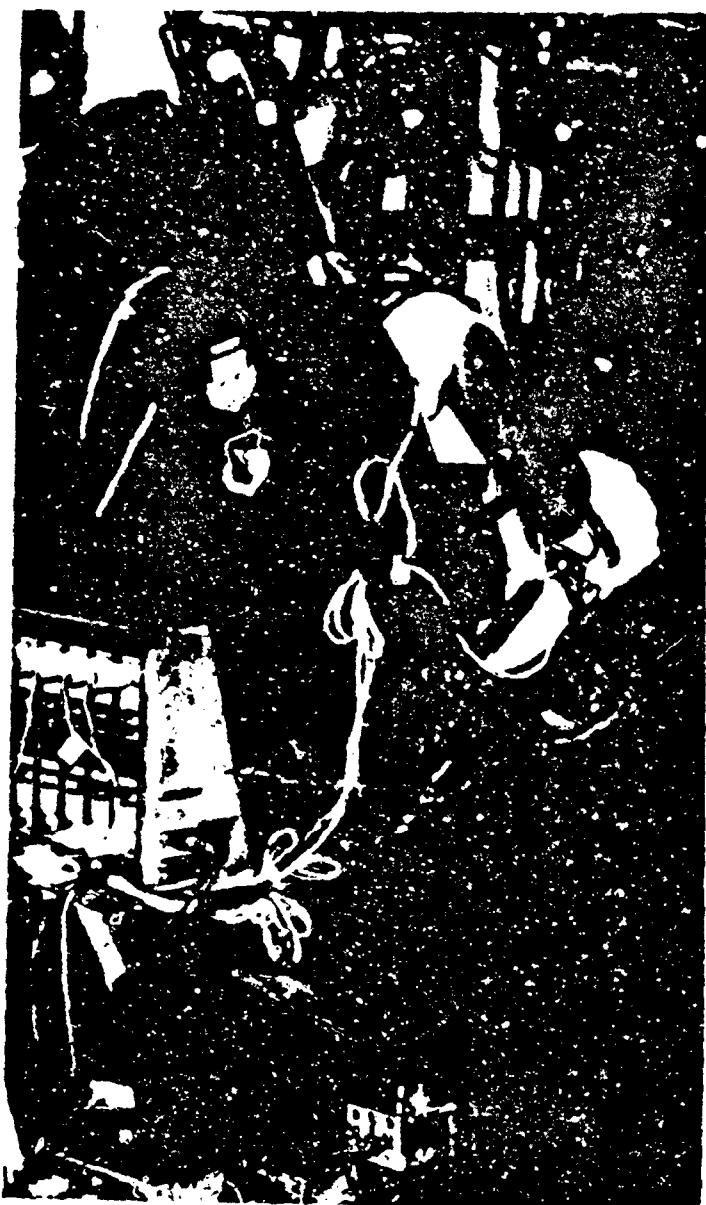
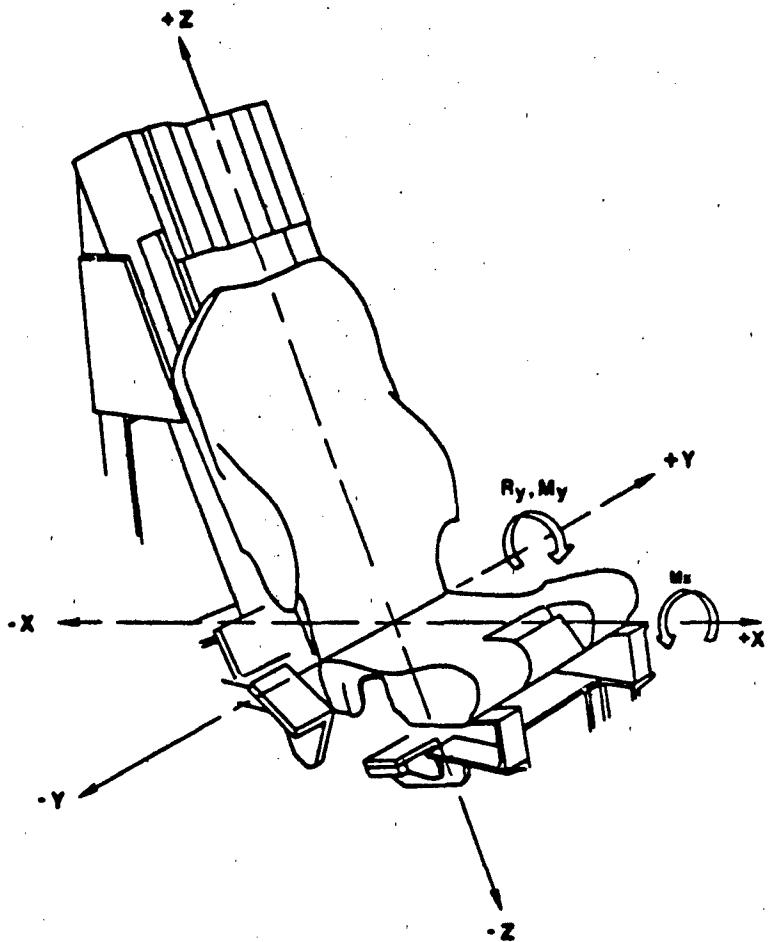


FIGURE A-4: X-BAND-90 HARNESS/-Gx CONFIGURATION



FIGURE A-5: -6x CONFIGURATION WITH EXTRA SEAT CUSHION



1. THE LINEAR ACCELEROMETERS WERE WIRED TO PROVIDE A POSITIVE OUTPUT VOLTAGE WHEN THE ACCELERATION EXPERIENCED BY THE ACCELEROMETER IS APPLIED IN THE $+x$, $+y$ OR $+z$ DIRECTION AS SHOWN.
2. THE ANGULAR R_y ACCELEROMETERS WERE WIRED TO PROVIDE A POSITIVE OUTPUT VOLTAGE WHEN THE ANGULAR ACCELERATION EXPERIENCED BY THE ANGULAR ACCELEROMETER IS APPLIED IN THE $+y$ DIRECTION ACCORDING TO THE RIGHT HAND RULE AS SHOWN.
3. THE LOAD CELLS AND STRAIN GAGES WERE WIRED TO PROVIDE A POSITIVE OUTPUT VOLTAGE WHEN THE FORCE EXERTED BY THE LOAD CELL ON THE SUBJECT IS APPLIED IN THE $+x$, $+y$ OR $+z$ DIRECTION AS SHOWN.
4. THE M_x and M_y TORQUE TRANSDUCERS WERE WIRED TO PROVIDE A POSITIVE OUTPUT VOLTAGE WHEN THE TORQUE EXPERIENCED BY THE TRANSDUCER IS APPLIED IN THE $+x$ OR $+y$ DIRECTION ACCORDING TO THE RIGHT HAND RULE AS SHOWN.

FIGURE A-6: AAMRL/BBP COORDINATE SYSTEM

3492
CHEST
ACCELEROMETERS

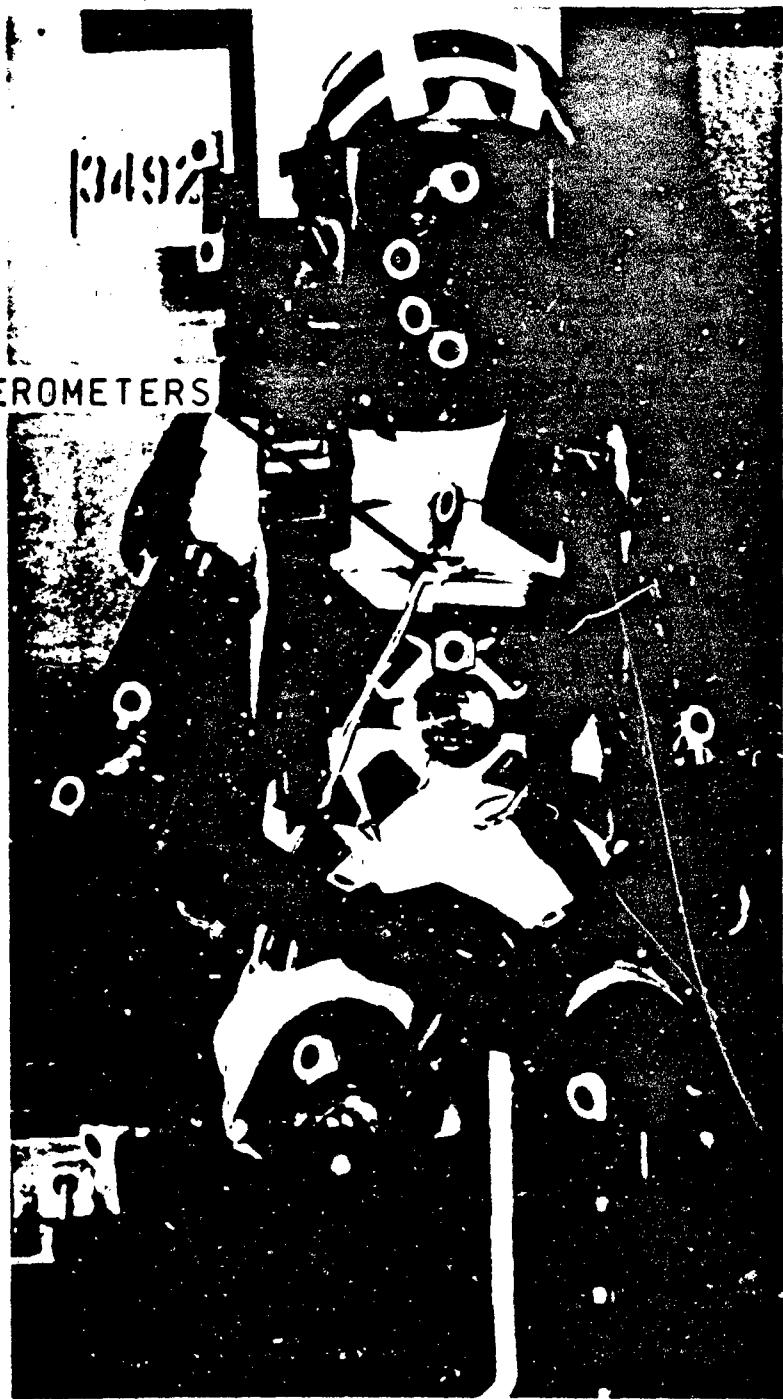
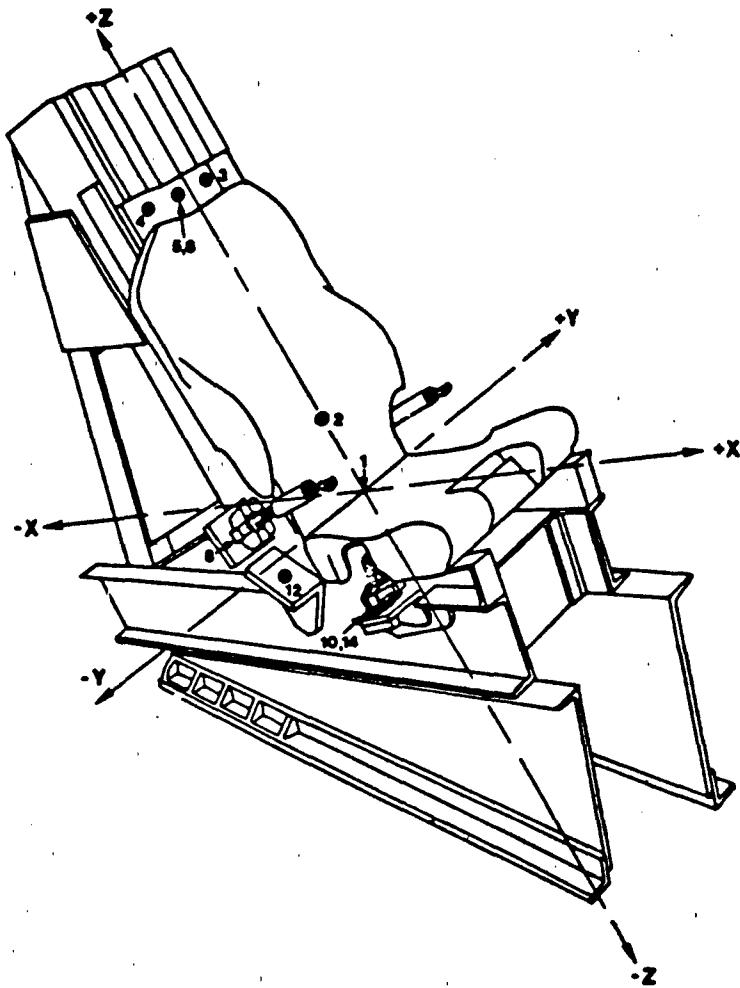


FIGURE A-7: CHEST ACCELEROMETER PACKAGE



NO. DESCRIPTION

- 1 SEAT REFERENCE POINT
- 2 SEAT BACK x, y & z ACCELERATION
- 3 LEFT SHOULDER x, y & z FORCE
- 4 RIGHT SHOULDER x, y & z FORCE
- 5 SHOULDER ROLLER y & z FORCE
- 6 SHOULDER ROLLER TORQUE (Mx)
- X-BAND-90 HARNESS:
- 7 LEFT HORIZONTAL x, y & z ANCHOR FORCE
- 8 RIGHT HORIZONTAL x, y & z ANCHOR FORCE
- 9 LEFT VERTICAL x, y & z ANCHOR FORCE
- 10 RIGHT VERTICAL x, y & z ANCHOR FORCE

NO. DESCRIPTION

X-BAND-45 HARNESS:

- 11 LEFT HORIZONTAL x, y & z ANCHOR FORCE
- 12 RIGHT HORIZONTAL x, y & z ANCHOR FORCE
- 13 LEFT VERTICAL x, y & z ANCHOR FORCE
- 14 RIGHT VERTICAL x, y & z ANCHOR FORCE

FOR REFERENCE ONLY:

- 15 LEFT SHOULDER ROLLER CENTER
- 16 RIGHT SHOULDER ROLLER CENTER

NOTE: ITEMS 7, 9, 11, 13, 15 AND 16 ARE NOT SHOWN.

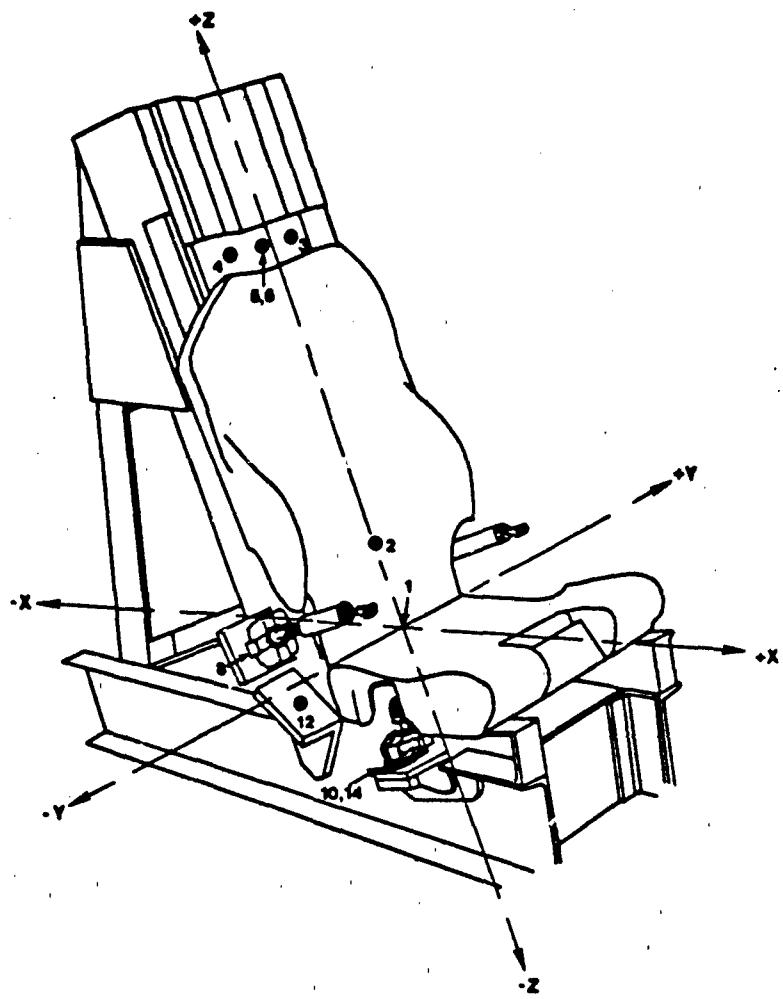
FIGURE A-8a: -Gx TEST CONFIGURATION TRANSDUCER LOCATIONS AND DIMENSIONS
(PAGE 1 OF 2)

ALL DIMENSIONS ARE REFERENCED TO THE SEAT REFERENCE POINT (SRP). THE SEAT REFERENCE POINT IS LOCATED AT THE INTERSECTION OF THE SEAT PAN CENTER LINE (X AXIS, 30 DEGREES ABOVE HORIZONTAL) AND THE SEAT BACK CENTER LINE (Z AXIS, 30 DEGREES AFT OF VERTICAL).

| NO. | CONTACT POINT DIMENSIONS IN INCHES (CM) | | | TRANSDUCER ATTACHMENT POINT IN INCHES (CM) | | |
|-----|---|----------------|----------------|--|----------------|----------------|
| | X | Y | Z | X | Y | Z |
| 1 | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| 2 | ----- | ----- | ----- | -0.71 (-0.28) | 0.00 (0.00) | 13.00 (5.12) |
| 3 | -4.88 (-12.41) | 2.63 (6.68) | 28.06 (71.27) | -2.78 (-7.05) | 2.63 (6.68) | 28.06 (71.27) |
| 4 | -4.88 (-12.41) | -2.46 (-6.26) | 28.06 (71.27) | -2.78 (-7.05) | -2.46 (-6.26) | 28.06 (71.27) |
| 5 | ----- | ----- | ----- | -2.98 (-7.58) | 0.48 (1.23) | 27.51 (69.88) |
| 6 | ----- | ----- | ----- | -2.36 (-6.00) | 0.48 (1.23) | 27.51 (69.88) |
| 7 | -3.38 (-8.58) | 7.98 (20.27) | 3.13 (7.94) | 5.71 (14.50) | 7.98 (20.27) | 3.93 (9.98) |
| 8 | -3.38 (-8.58) | -8.11 (-20.59) | 3.13 (7.94) | 5.71 (14.50) | -8.11 (-20.59) | 3.93 (9.98) |
| 9 | 7.48 (19.00) | 8.08 (20.52) | -4.28 (-10.87) | 7.48 (19.00) | 8.08 (20.52) | -2.52 (-6.40) |
| 10 | 7.48 (19.00) | -7.97 (-20.25) | -4.28 (-10.87) | 7.48 (19.00) | -7.97 (-20.25) | -2.52 (-6.40) |
| 11 | -1.97 (-5.00) | 8.30 (21.07) | 0.26 (0.66) | -0.67 (-1.70) | 8.30 (21.07) | 1.17 (2.96) |
| 12 | -1.97 (-5.00) | -8.15 (-20.70) | 0.26 (0.66) | -0.67 (-1.70) | -8.15 (-20.70) | 1.17 (2.96) |
| 13 | 7.87 (20.00) | 8.12 (20.62) | -3.37 (-8.57) | 7.87 (20.00) | -8.12 (20.62) | -1.67 (-4.23) |
| 14 | 7.87 (20.00) | -8.06 (-20.47) | -3.37 (-8.57) | 7.87 (20.00) | -8.06 (-20.47) | -1.67 (-4.23) |
| 15 | ----- | ----- | ----- | 0.57 (1.45) | -2.48 (-6.29) | 27.31 (69.36) |
| 16 | ----- | ----- | ----- | 0.57 (1.45) | 2.54 (6.46) | 27.31 (69.36) |

SEE FIGURE A-8a FOR DESCRIPTIONS OF TRANSDUCER ITEM NUMBERS
 THE SEAT BACK ACCELEROMETER MEASUREMENTS (ITEM 2) ARE TAKEN AT THE CENTER OF THE ACCELEROMETER BLOCK.
 SHOULDER ROLLER Y AND Z FORCE MEASUREMENTS (ITEM 5) ARE TAKEN AT THE MIDPOINT OF THE SHOULDER ROLLER Y AND Z
 FORCE STRAIN GAGES.
 SHOULDER ROLLER TORQUE (Mx) MEASUREMENTS (ITEM 6) ARE TAKEN AT THE MIDPOINT OF THE SHOULDER ROLLER Mx TORQUE
 STRAIN GAGES.
 THE CONTACT POINT IS THE POINT ON THE LOAD CELL AT WHICH THE EXTERNAL FORCE IS APPLIED.
 THE LOAD CELL ATTACHMENT POINT IS THE POINT AT WHICH THE HARNESS STRAP IS ATTACHED TO THE LOAD CELL.

FIGURE A-8b: -Gx TEST CONFIGURATION TRANSDUCER LOCATIONS AND DIMENSIONS (PAGE 2 OF 2)



NO. DESCRIPTION

- 1 SEAT REFERENCE POINT
- 2 SEAT BACK x, y & z ACCELERATION
- 3 LEFT SHOULDER x, y & z FORCE
- 4 RIGHT SHOULDER x, y & z FORCE
- 5 SHOULDER ROLLER y & z FORCE
- 6 SHOULDER ROLLER TORQUE (Mx)
- X-BAND-45 HARNESS:
- 7 LEFT HORIZONTAL x, y & z ANCHOR FORCE
- 8 RIGHT HORIZONTAL x, y & z ANCHOR FORCE
- 9 LEFT VERTICAL x, y & z ANCHOR FORCE
- 10 RIGHT VERTICAL x, y & z ANCHOR FORCE

NO. DESCRIPTION

- X-BAND-45 HARNESS:
- 11 LEFT HORIZONTAL x, y & z ANCHOR FORCE
- 12 RIGHT HORIZONTAL x, y & z ANCHOR FORCE
- 13 LEFT VERTICAL x, y & z ANCHOR FORCE
- 14 RIGHT VERTICAL x, y & z ANCHOR FORCE
- FOR REFERENCE ONLY:
- 15 LEFT SHOULDER ROLLER CENTER
- 16 RIGHT SHOULDER ROLLER CENTER

NOTE: ITEMS 7, 9, 11, 13, 15 AND 16 ARE NOT SHOWN.

FIGURE A-9a: +Gy TEST CONFIGURATION TRANSDUCER LOCATIONS AND DIMENSIONS
(PAGE 1 OF 2)

ALL DIMENSIONS ARE REFERENCED TO THE SEAT REFERENCE POINT (SRP). THE SEAT REFERENCE POINT IS LOCATED AT THE INTERSECTION OF THE SEAT PAN CENTER LINE (X AXIS, 13 DEGREES ABOVE HORIZONTAL) AND THE SEAT BACK CENTER LINE (Z AXIS, 13 DEGREES AFT OF VERTICAL).

| No. | CONTACT POINT DIMENSIONS IN INCHES (CM) | | | TRANSDUCER ATTACHMENT POINT IN INCHES (CM) | | |
|-----|---|----------------|----------------|--|----------------|----------------|
| | X | Y | Z | X | Y | Z |
| 1 | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| 2 | — | — | — | -0.71 (-0.28) | 0.00 (0.00) | 13.00 (5.12) |
| 3 | -4.88 (-12.41) | 2.63 (6.68) | 28.06 (71.27) | -2.78 (-7.05) | 2.63 (6.68) | 28.06 (71.27) |
| 4 | -4.88 (-12.41) | -2.46 (-6.26) | 28.06 (71.27) | -2.78 (-7.05) | -2.46 (-6.26) | 28.06 (71.27) |
| 5 | — | — | — | -2.98 (-7.98) | 0.48 (1.23) | 27.51 (69.88) |
| 6 | — | — | — | -2.36 (-6.00) | 0.48 (1.23) | 27.51 (69.88) |
| 7 | -3.38 (-8.58) | 7.98 (20.27) | 3.13 (7.94) | 5.71 (14.50) | 7.98 (20.27) | 3.93 (9.98) |
| 8 | -3.38 (-8.58) | -8.11 (-20.59) | 3.13 (7.94) | 5.71 (14.50) | -8.11 (-20.59) | 3.93 (9.98) |
| 9 | 7.48 (19.00) | 8.08 (20.52) | -4.28 (-10.87) | 7.48 (19.00) | 8.08 (20.52) | -2.52 (-6.40) |
| 10 | 7.48 (19.00) | -7.97 (-20.25) | -4.28 (-10.87) | 7.48 (19.00) | -7.97 (-20.25) | -2.52 (-6.40) |
| 11 | -1.97 (-5.00) | 8.30 (21.07) | 0.26 (0.66) | -0.67 (-1.70) | 8.30 (21.07) | 1.17 (2.96) |
| 12 | -1.97 (-5.00) | -8.15 (-20.70) | 0.26 (0.66) | -0.67 (-1.70) | -8.15 (-20.70) | 1.17 (2.96) |
| 13 | 7.87 (20.00) | 8.12 (20.62) | -3.37 (-8.57) | 7.87 (20.00) | -8.12 (20.62) | -1.67 (-4.23) |
| 14 | 7.87 (20.00) | -8.06 (-20.47) | -3.37 (-8.57) | 7.87 (20.00) | -8.06 (-20.47) | -1.67 (-4.23) |
| 15 | — | — | — | 0.57 (1.45) | -2.48 (-6.29) | 27.31 (69.36) |
| 16 | — | — | — | 0.57 (1.45) | 2.54 (6.46) | 27.31 (69.36) |

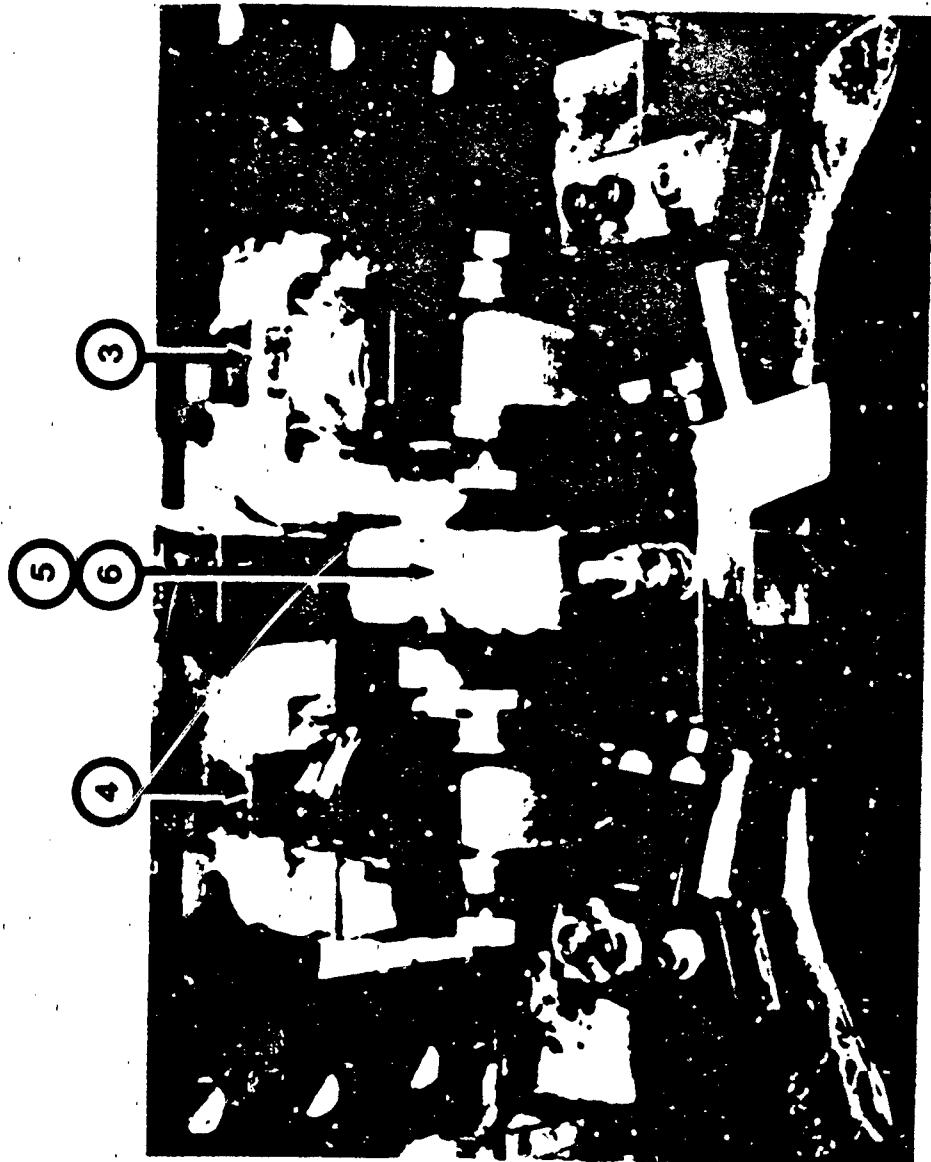
A-40

SEE FIGURE A-9a FOR DESCRIPTIONS OF TRANSDUCER ITEM NUMBERS

THE SEAT BACK ACCELEROMETER MEASUREMENTS (ITEM 2) ARE TAKEN AT THE CENTER OF THE ACCELEROMETER BLOCK.
 SHOULDER ROLLER Y AND Z FORCE MEASUREMENTS (ITEM 5) ARE TAKEN AT THE MIDPOINT OF THE SHOULDER ROLLER Y AND Z
 FORCE STRAIN GAGES.
 SHOULDER ROLLER TORQUE (Mx) MEASUREMENTS (ITEM 6) ARE TAKEN AT THE MIDPOINT OF THE SHOULDER ROLLER Mx TORQUE
 STRAIN GAGES.

THE CONTACT POINT IS THE POINT ON THE LOAD CELL AT WHICH THE EXTERNAL FORCE IS APPLIED.
 THE LOAD CELL ATTACHMENT POINT IS THE POINT AT WHICH THE HARNESS STRAP IS ATTACHED TO THE LOAD CELL.

FIGURE A-9b: +6y TEST CONFIGURATION TRANSDUCER LOCATIONS AND DIMENSIONS (PAGE 2 OF 2)



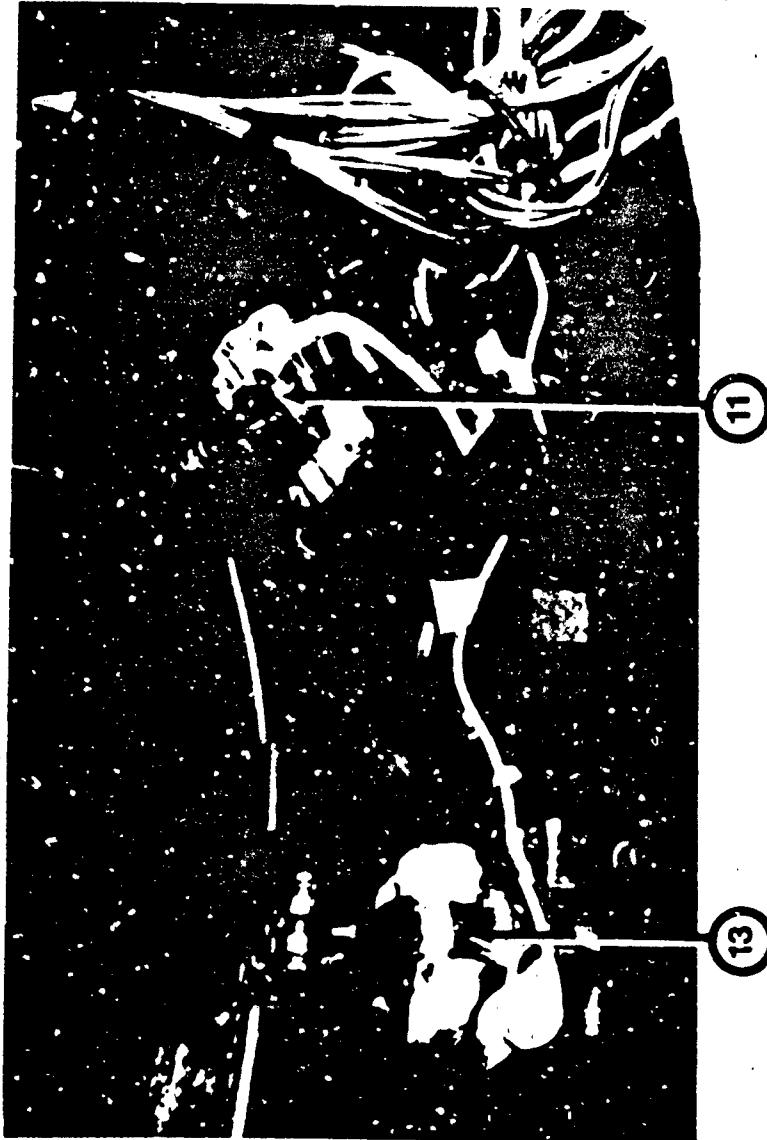
REFER TO FIGURE 8a FOR A DESCRIPTION OF THE TRANSDUCER ITEM NUMBERS

FIGURE A-10: LEFT/RIGHT SHOULDER ANCHOR LOAD CELLS



REFER TO FIGURE A-8a FOR A DESCRIPTION OF THE TRANSDUCER ITEM NUMBERS

FIGURE A-11: T-BAR INSTRUMENTATION



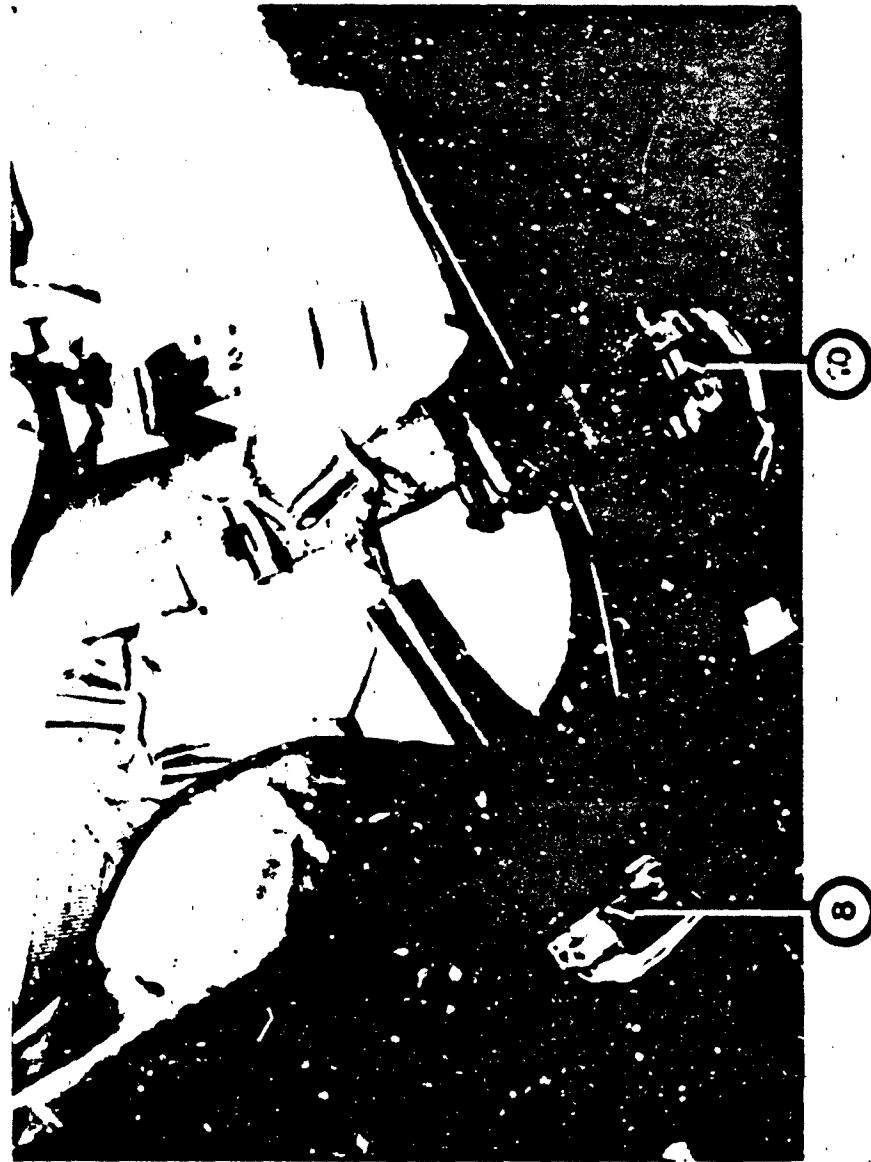
REFER TO FIGURE A-9a FOR A DESCRIPTION OF THE TRANSDUCER ITEM NUMBERS

FIGURE A-12: LEFT HORIZONTAL/VERTICAL ANCHOR LOAD CELLS
+GY CONFIGURATION/X-BAND-45 HARNESS LOCATIONS



REFER TO FIGURE A-9a FOR A DESCRIPTION OF THE TRANSDUCER ITEM NUMBERS

FIGURE A-13: RIGHT HORIZONTAL/VERTICAL ANCHOR LOAD CELLS
+Gy CONFIGURATION/X-BAND-45 HARNESS LOCATIONS



REFER TO FIGURE A-8a FOR A DESCRIPTION OF THE TRANSDUCER ITEM NUMBERS

FIGURE A-14: RIGHT HORIZONTAL/VERTICAL ANCHOR LOAD CELLS
-Gx CONFIGURATION/X-BAND-90 HARNESS LOCATIONS

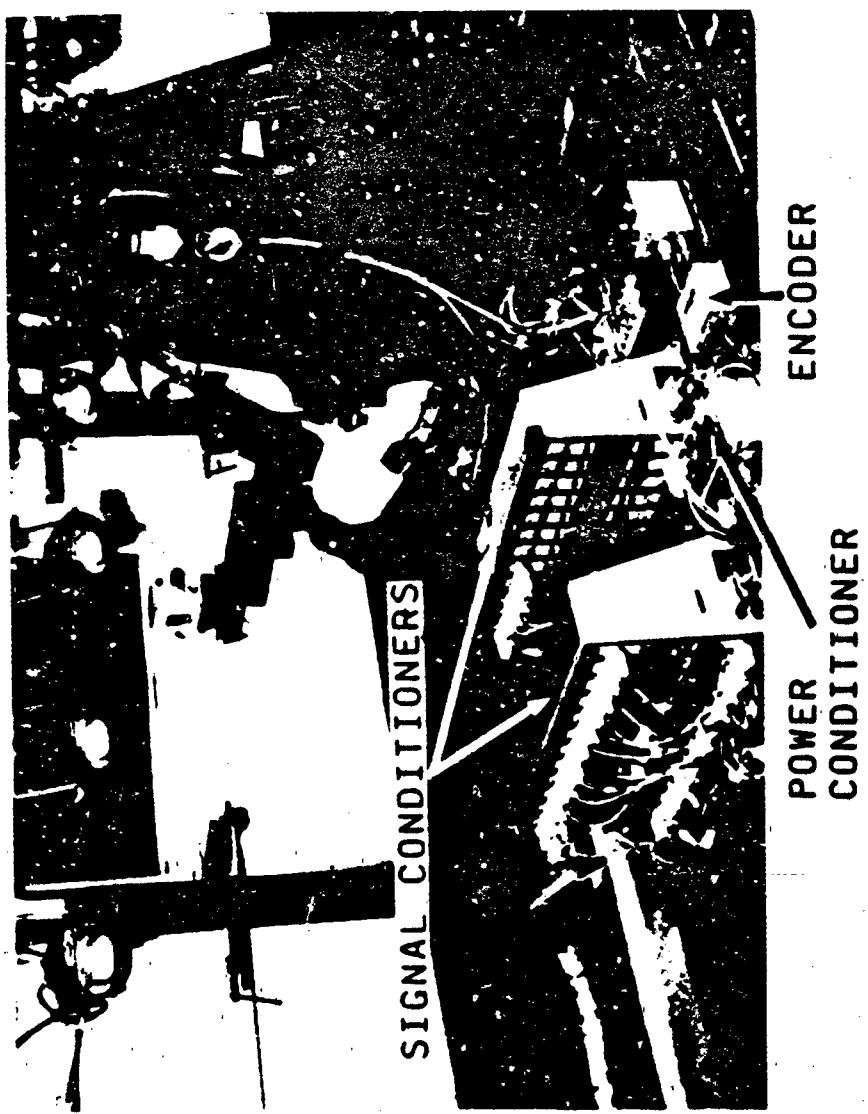


FIGURE A-15: ADACS INSTALLATION/+6y CONFIGURATION

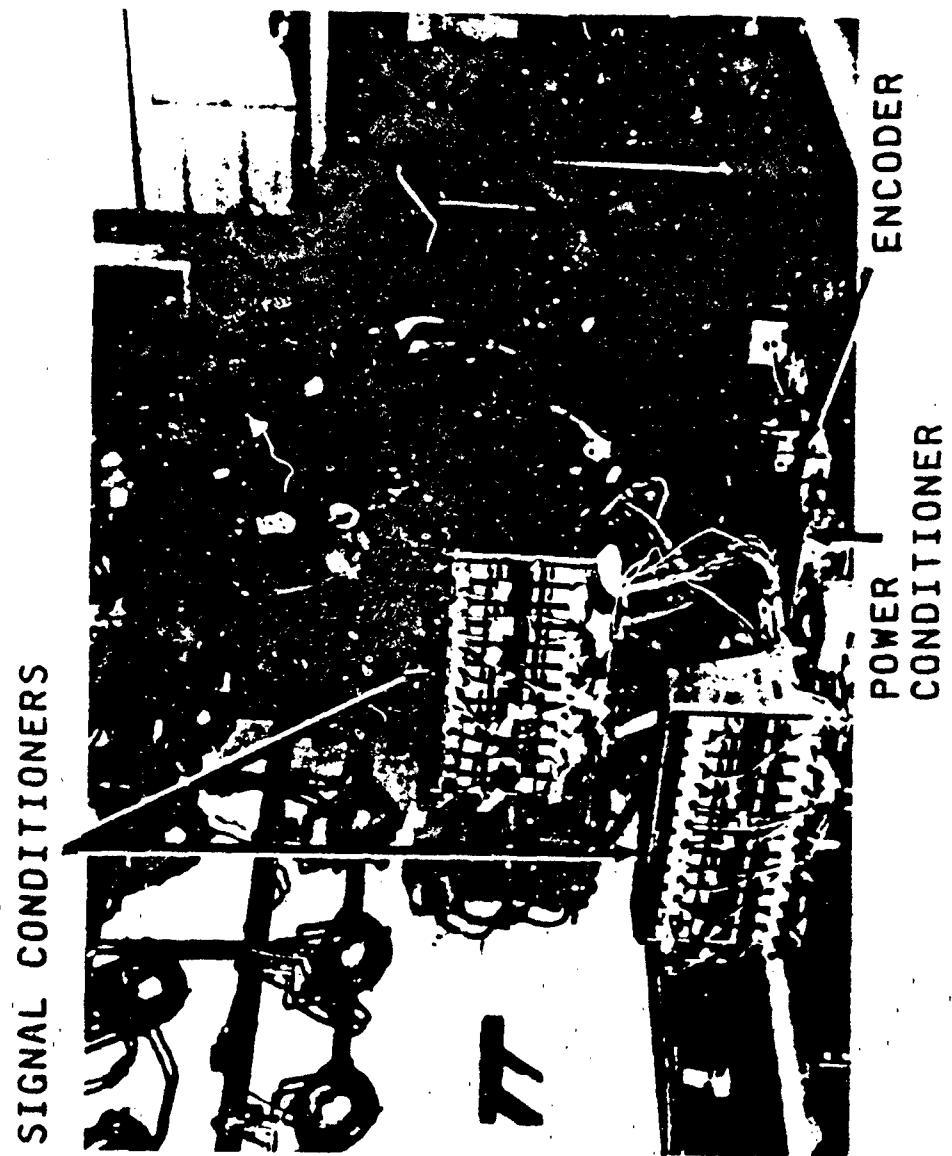


FIGURE A-16: ADACS INSTALLATION/-GX CONFIGURATION

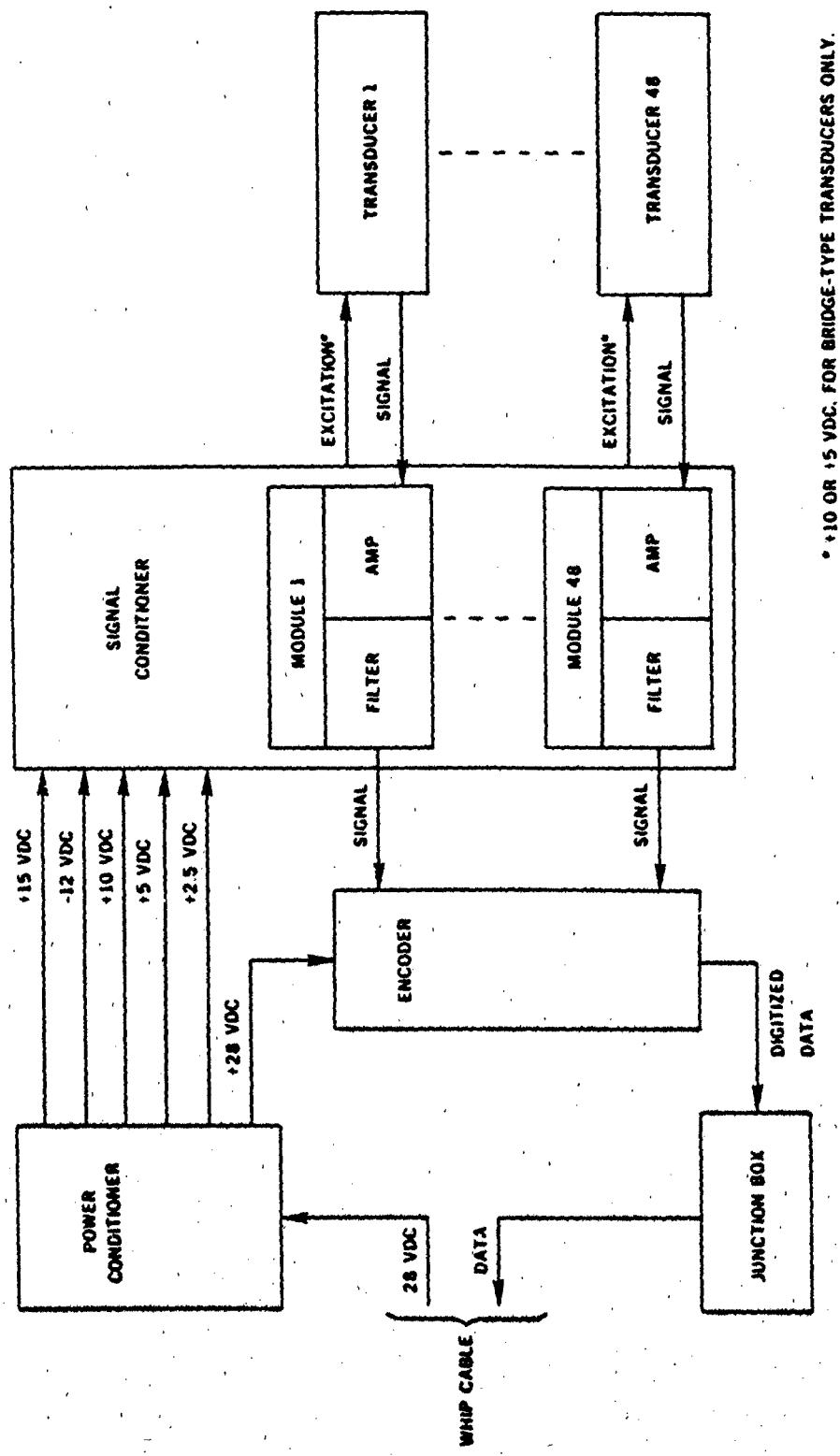


FIGURE A-17: AUTOMATIC DATA ACQUISITION AND CONTROL SYSTEM

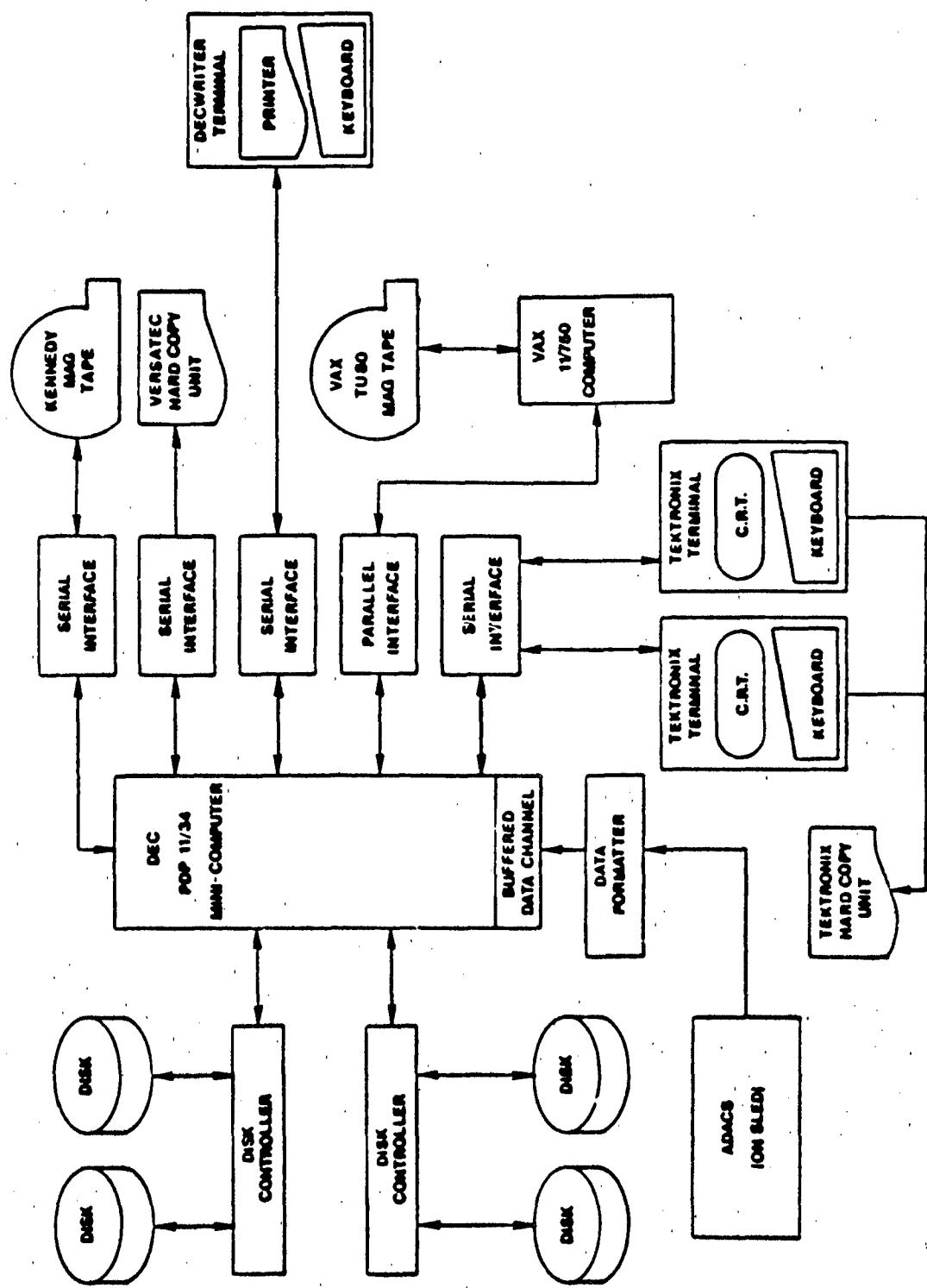
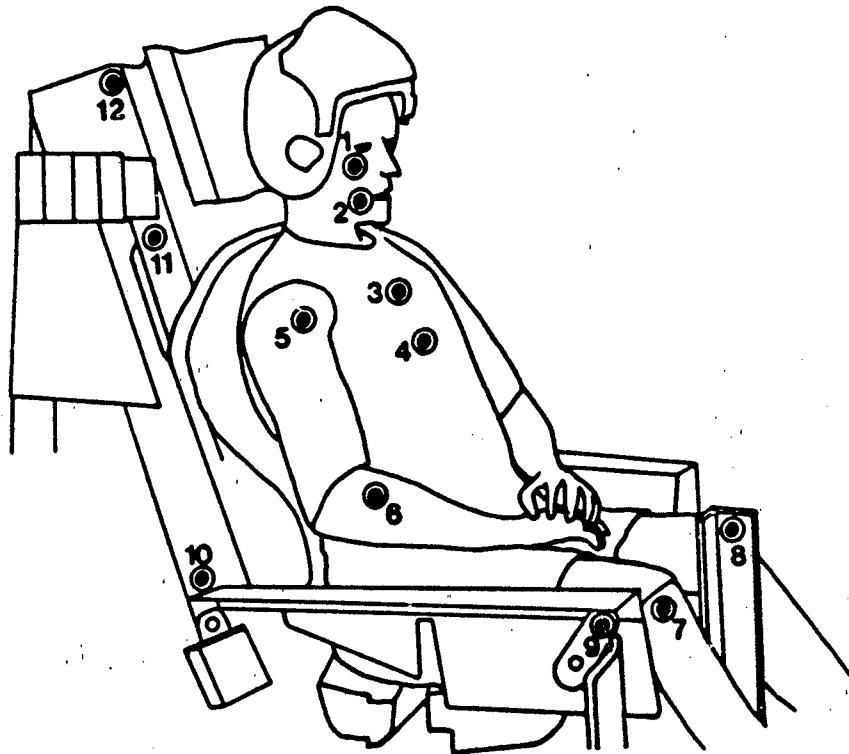


FIGURE A-18: DATA ACQUISITION AND STORAGE SYSTEM BLOCK DIAGRAM



ALL DIMENSIONS ARE REFERENCED TO THE SEAT REFERENCE POINT (SRP). THE SEAT REFERENCE POINT IS LOCATED AT THE INTERSECTION OF THE SEAT PAN CENTER LINE (x AXIS, 13 DEGREES ABOVE HORIZONTAL) AND THE SEAT BACK CENTER LINE (z AXIS, 13 DEGREES AFT OF VERTICAL).

| DESCRIPTION | DIMENSIONS IN FEET | | |
|------------------------|--------------------|---------|--------|
| | x | y | z |
| 1. CHEEK | - | - | - |
| 2. MOUTH | - | - | - |
| 3. UPPER CHEST | - | - | - |
| 4. LOWER CHEST | - | - | - |
| 5. SHOULDER | - | - | - |
| 6. ELBOW | - | - | - |
| 7. KNEE | - | - | - |
| 8. CENTER BRACKET | 2.1635 | 0.1322 | 0.3608 |
| 9. FORE SIDE PLATE | 1.9841 | -1.0072 | 0.2881 |
| 10. AFT SIDE PLATE | -0.2387 | -0.9646 | 0.7383 |
| 11. RIGHT CENTER FRAME | -0.2020 | -0.6037 | 2.4942 |
| 12. RIGHT UPPER FRAME | -0.1303 | -0.5709 | 3.2349 |

FIGURE A-19: +Gy TEST CONFIGURATION FIDUCIAL TARGET LOCATIONS

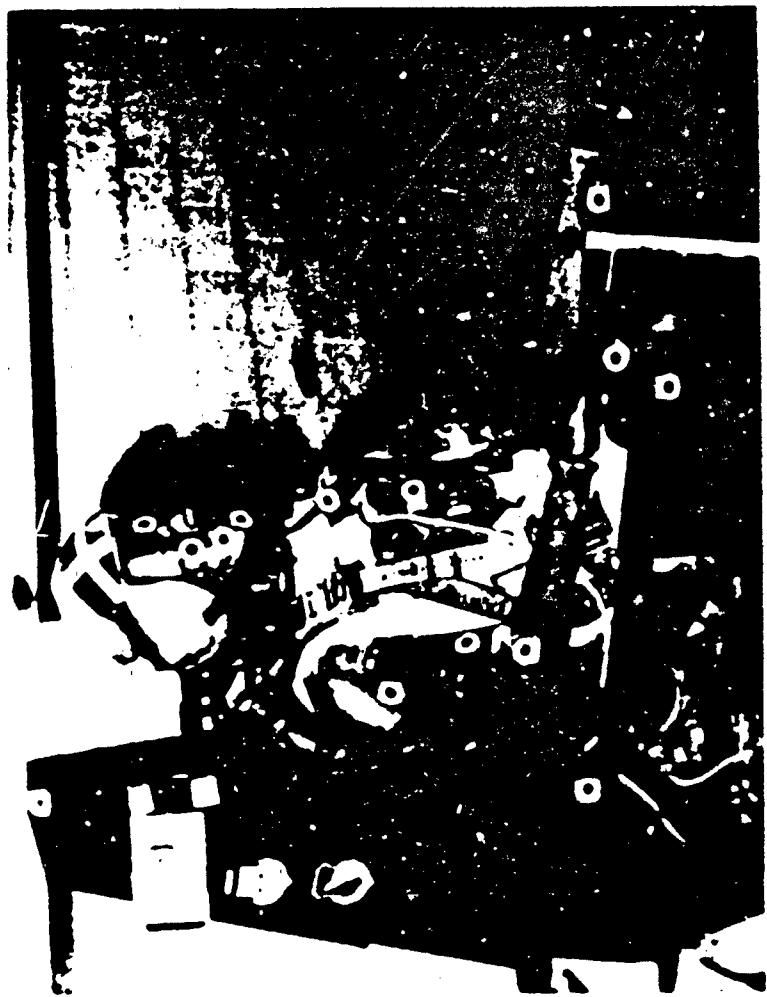
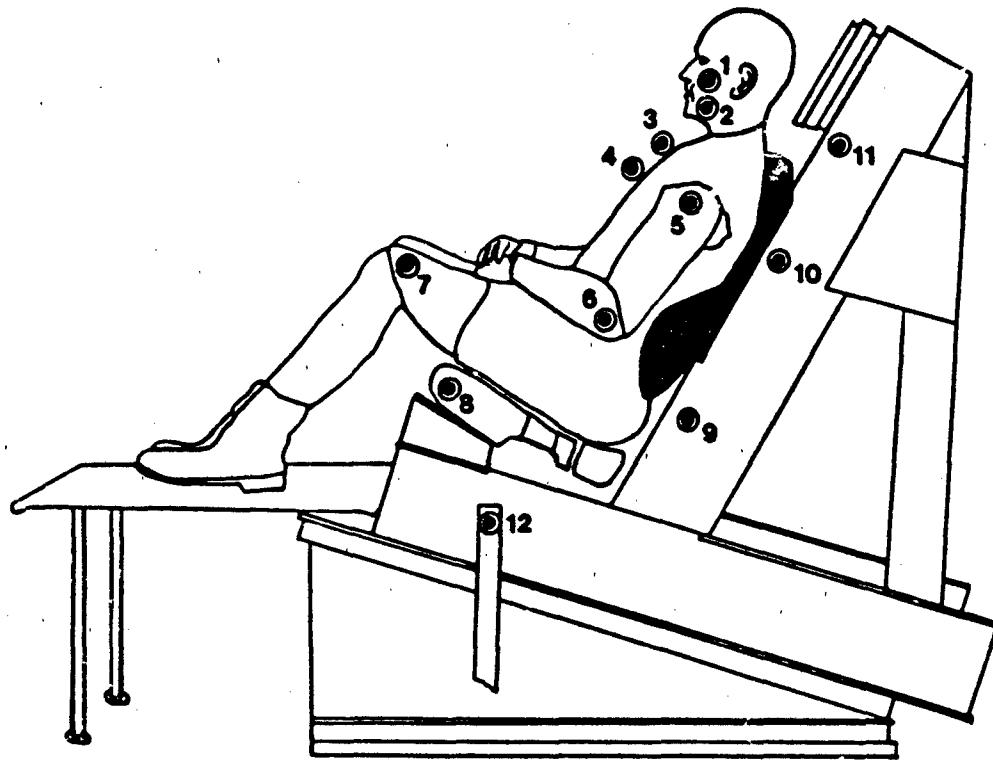


FIGURE A-20: +Gy CONFIGURATION FIDUCIAL TARGETS



ALL DIMENSIONS ARE REFERENCED TO THE SEAT REFERENCE POINT (SRP). THE SEAT REFERENCE POINT IS LOCATED AT THE INTERSECTION OF THE SEAT PAN CENTER LINE (x AXIS, 30 DEGREES ABOVE HORIZONTAL) AND THE SEAT BACK CENTER LINE (z AXIS, 30 DEGREES AFT OF VERTICAL).

| DESCRIPTION | DIMENSIONS IN FEET | | |
|---------------------|--------------------|--------|---------|
| | x | y | z |
| 1. CHEEK | - | - | - |
| 2. MOUTH | - | - | - |
| 3. UPPER CHEST | - | - | - |
| 4. LOWER CHEST | - | - | - |
| 5. SHOULDER | - | - | - |
| 6. ELBOW | - | - | - |
| 7. KNEE | - | - | - |
| 8. SEAT PAN | 1.2216 | 0.7136 | -0.4663 |
| 9. LOAD CELL MOUNT | -0.4143 | 0.8527 | 0.3369 |
| 10. SEAT BACK | -0.0006 | 0.6699 | 1.4104 |
| 11. NUMBER PLATE | -0.0053 | 0.4808 | 2.4526 |
| 12. AFT BRACKET ARM | 0.6245 | 2.1675 | -0.5590 |

FIGURE A-21: -G_x TEST CONFIGURATION FIDUCIAL TARGET LOCATIONS

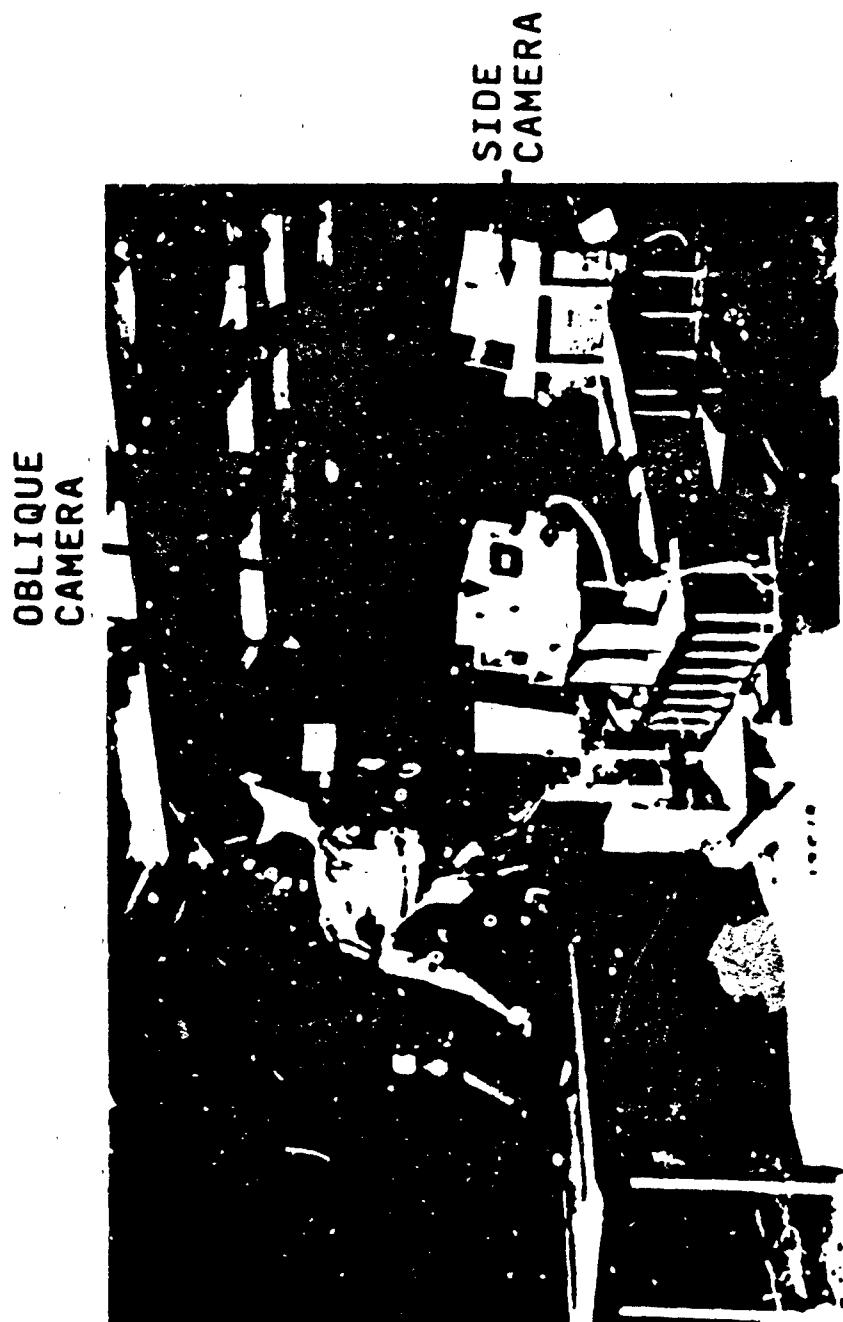


FIGURE A-22: -6x CONFIGURATION FIDUCIAL TARGETS/CAMERA LOCATIONS

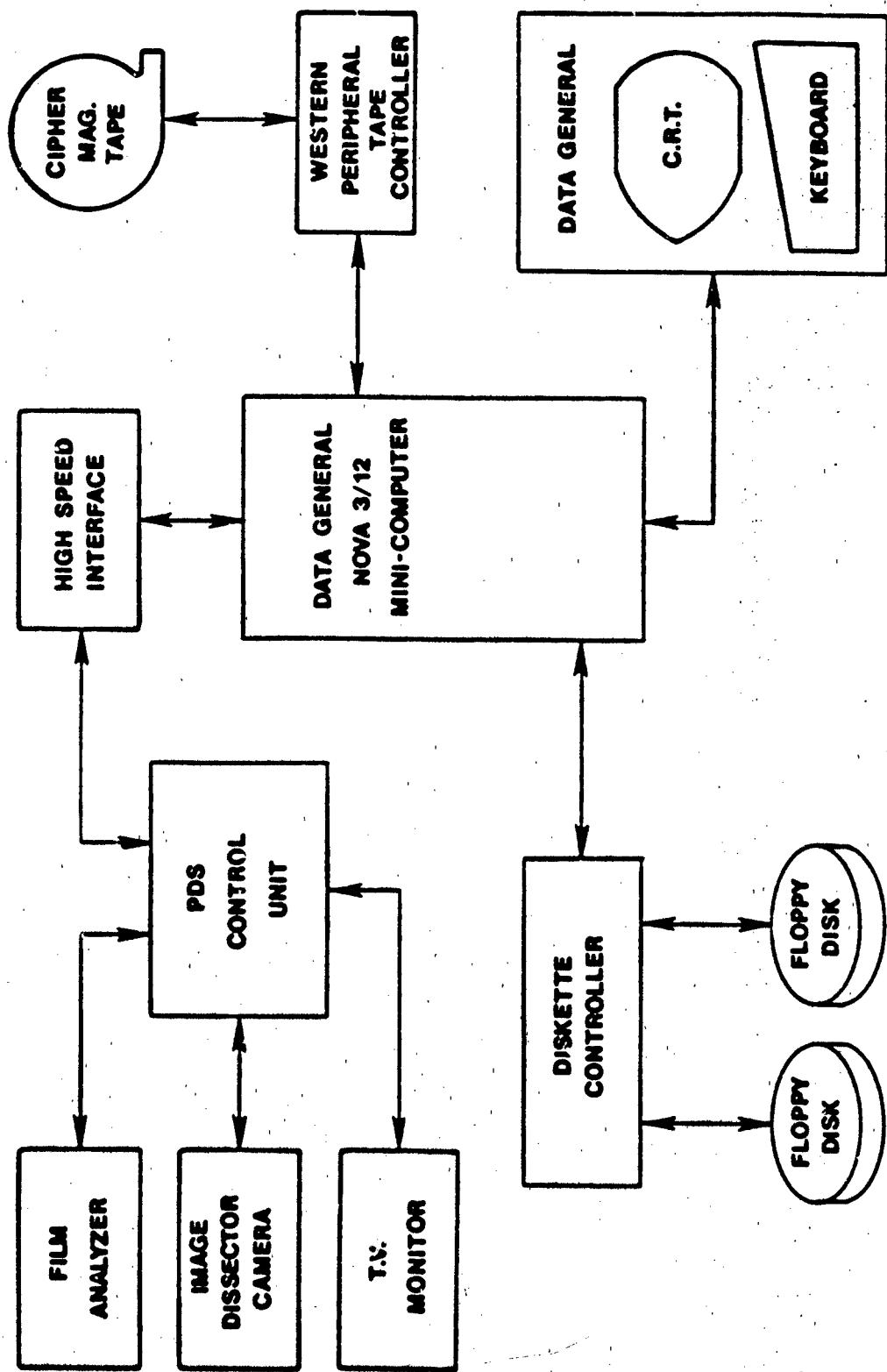


FIGURE A-23: AUTOMATIC FILM READER

APPENDIX B

**ADACS Data Summaries
and Graphs for ADAM Tests**

CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S WT: 143.0 NOM G: 8.0 CELL: A

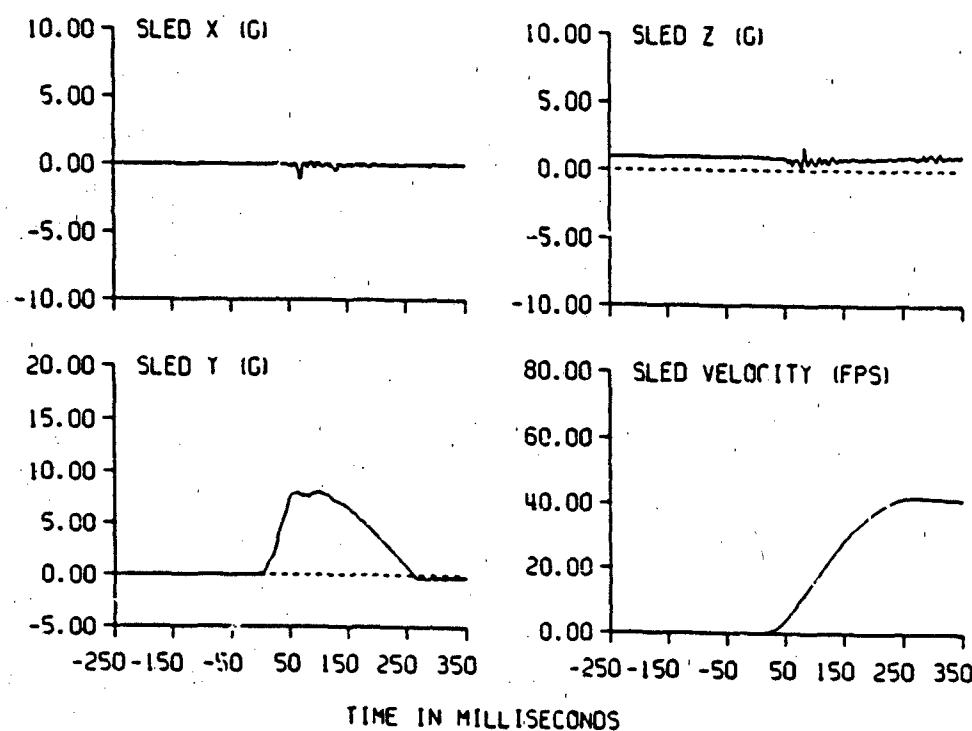
| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -254. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 0. | 1. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 1. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.19 | -1.11 | 88. | 69. |
| Y AXIS | 0.01 | 8.10 | -0.43 | 100. | 312. |
| Z AXIS | 0.99 | 1.67 | 0.14 | 83. | 78. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.23 | 1.26 | -1.81 | 79. | 71. |
| Y AXIS | -0.01 | 11.22 | -0.76 | 87. | 304. |
| Z AXIS | 0.94 | 2.35 | -0.37 | 85. | 80. |
| RESULTANT | 0.97 | 11.37 | 0.79 | 87. | 278. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.28 | 5.56 | -4.07 | 70. | 105. |
| Y AXIS | 0.29 | 18.34 | -1.46 | 72. | 306. |
| Z AXIS | 0.98 | 5.96 | -3.18 | 90. | 120. |
| RESULTANT | 1.06 | 19.04 | 0.85 | 71. | 262. |
| RY (RAD/SEC2) | -5.31 | 1027.42 | -1345.49 | 80. | 94. |
| SLED VELOCITY (FPS) | -0.02 | 42.04 | -0.02 | 272. | 0. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -6.04 | 4.01 | -15.63 | 57. | 73. |
| LEFT Y AXIS | 2.74 | 35.59 | -0.09 | 83. | 326. |
| LEFT Z AXIS | 3.94 | 8.49 | 1.61 | 74. | 56. |
| LEFT RESULTANT | 7.75 | 36.55 | 3.53 | 84. | 303. |
| RIGHT X AXIS | -5.32 | 1.98 | -197.66 | 331. | 98. |
| RIGHT Y AXIS | 1.19 | 42.04 | -1.19 | 127. | 300. |
| RIGHT Z AXIS | 1.27 | 2.64 | -2.44 | 27. | 57. |
| RIGHT RESULTANT | 5.64 | 201.18 | 0.10 | 99. | 316. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 1.95 | 152.78 | -8.85 | 128. | 345. |
| Z AXIS FORCE (LB) | 11.36 | 125.93 | 2.16 | 95. | 304. |
| X AXIS TORQUE (IN-LB) | 4.57 | 322.38 | -19.18 | 93. | 342. |

CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S WT: 143.0 NOM G: 8.0 CELL: A

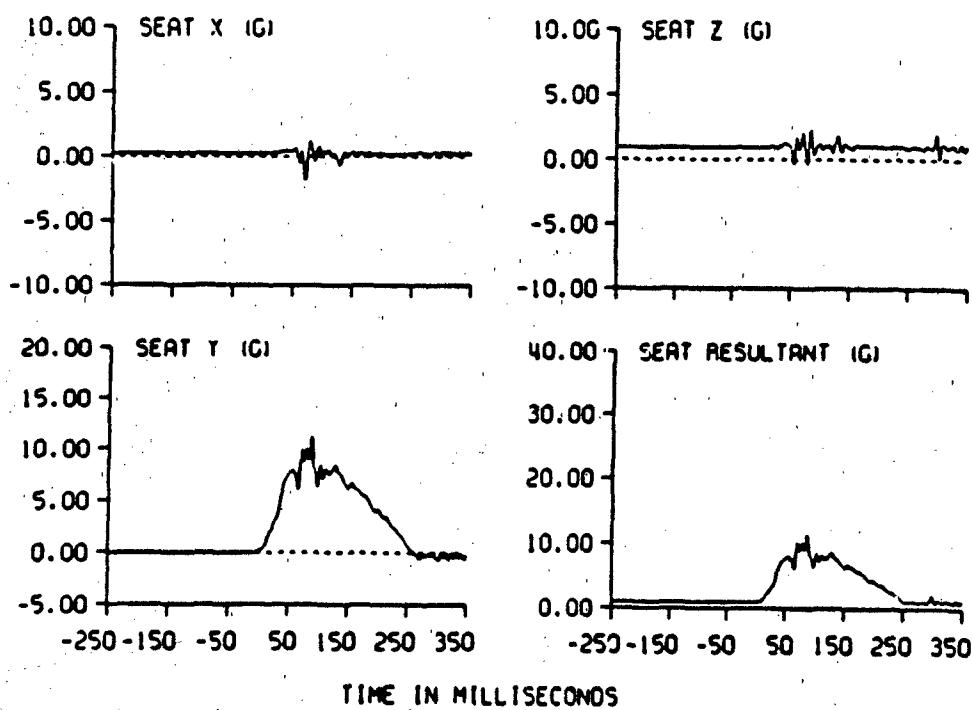
| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -0.06 | 1.50 | -0.06 | 17. | 0. |
| LEFT HORIZ Y AXIS | 16.62 | 235.65 | -2.57 | 78. | 347. |
| LEFT HORIZ Z AXIS | 11.95 | 86.52 | 0.03 | 70. | 335. |
| LEFT RESULTANT | 20.49 | 251.03 | 0.84 | 78. | 342. |
| RIGHT HORIZ X AXIS | -15.44 | 3.06 | -18.81 | 51. | 346. |
| RIGHT HORIZ Y AXIS | -12.28 | 22.68 | -12.49 | 72. | 1. |
| RIGHT HORIZ Z AXIS | 13.88 | 15.11 | 1.65 | 1. | 44. |
| RIGHT RESULTANT | 24.14 | 25.18 | 8.86 | 346. | 32. |
| LEFT VERT X AXIS | 3.07 | 48.08 | -1.80 | 120. | 304. |
| LEFT VERT Y AXIS | -0.76 | 275.05 | -60.56 | 52. | 78. |
| LEFT VERT Z AXIS | -3.82 | 4.31 | -178.53 | 324. | 121. |
| LEFT RESULTANT | 4.96 | 276.30 | 1.84 | 52. | 317. |
| RIGHT VERT X AXIS | 4.95 | 10.65 | -1.99 | 106. | 304. |
| RIGHT VERT Y AXIS | 0.21 | 24.35 | -1.52 | 73. | 286. |
| RIGHT VERT Z AXIS | -9.00 | 0.77 | -21.74 | 39. | 113. |
| RIGHT RESULTANT | 10.32 | 30.98 | 0.82 | 115. | 271. |
| ADAM INTERNAL TEMP (DEG C) | 122.33 | 124.60 | 122.10 | 77. | 3. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | 0.07 | 16.46 | -2.18 | 140. | 264. |
| HEAD Z AXIS | 0.96 | 4.17 | -14.40 | 71. | 109. |
| CHEST Y AXIS | 0.07 | 15.27 | -1.19 | 88. | 349. |
| LUMBAR Y AXIS | 0.00 | 17.24 | -0.97 | 68. | 321. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | 3.98 | 12.58 | -154.51 | 266. | 139. |
| NECK Z AXIS | 22.16 | 234.43 | -22.37 | 127. | 72. |
| LUMBAR Y AXIS | 15.82 | 177.57 | -90.82 | 125. | 64. |
| ADAM NECK MX TORQUE (IN-LB) | 3.67 | 437.72 | -175.09 | 144. | 78. |

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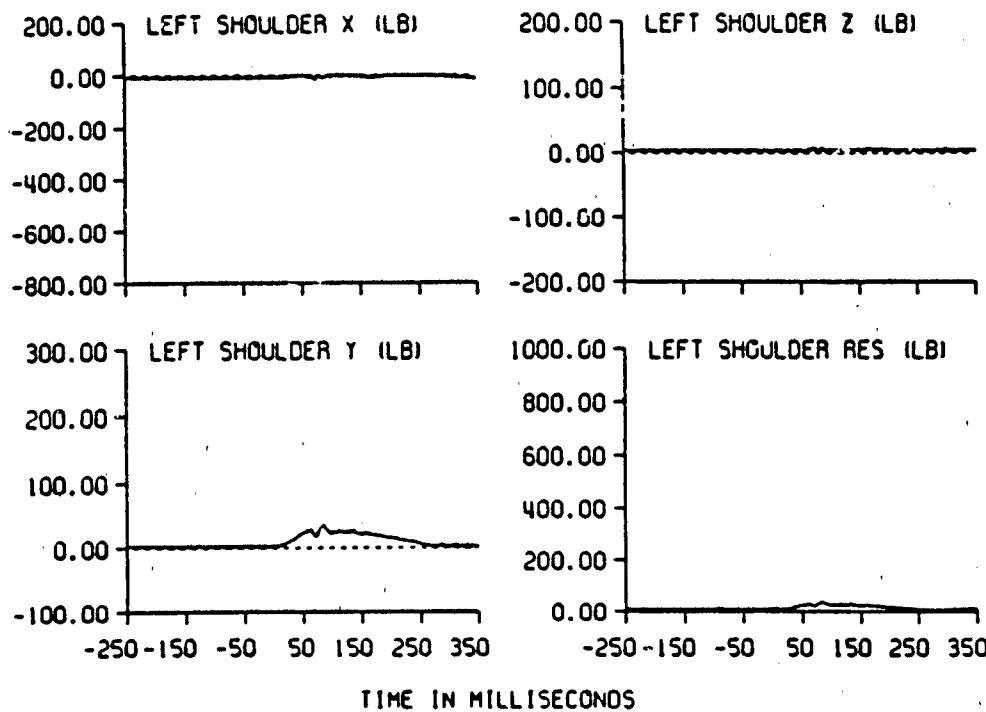
CHIA STUDY •GT TEST: 3484 SUBJ: ADAM-S CELL: A



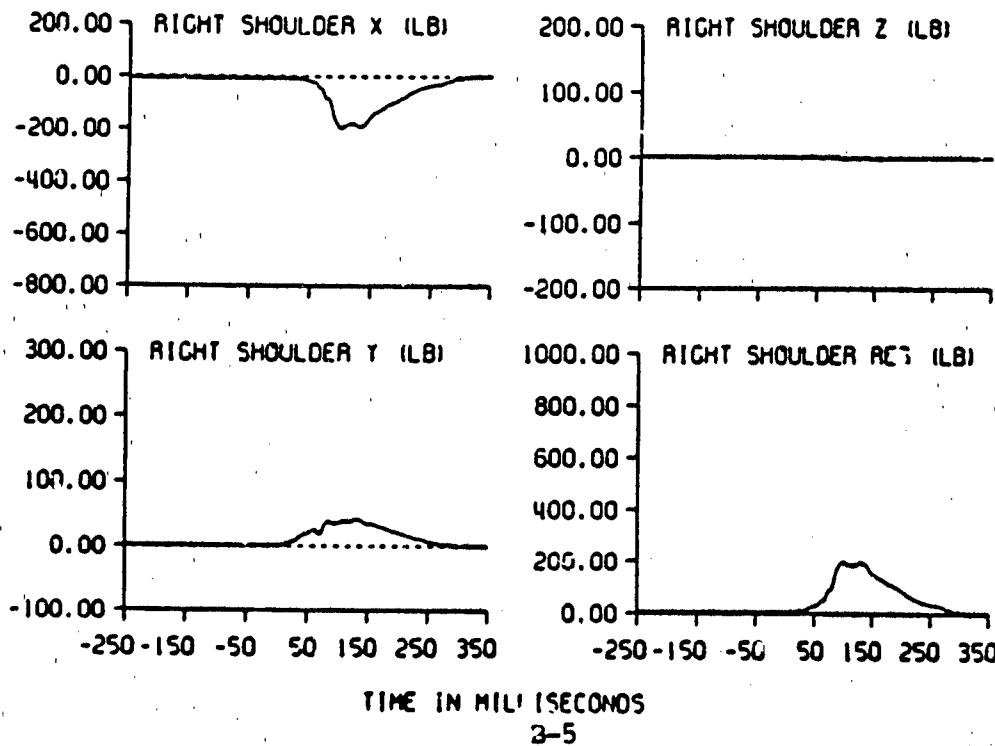
CHIA STUDY •GT TEST: 3484 SUBJ: ADAM-S CELL: A



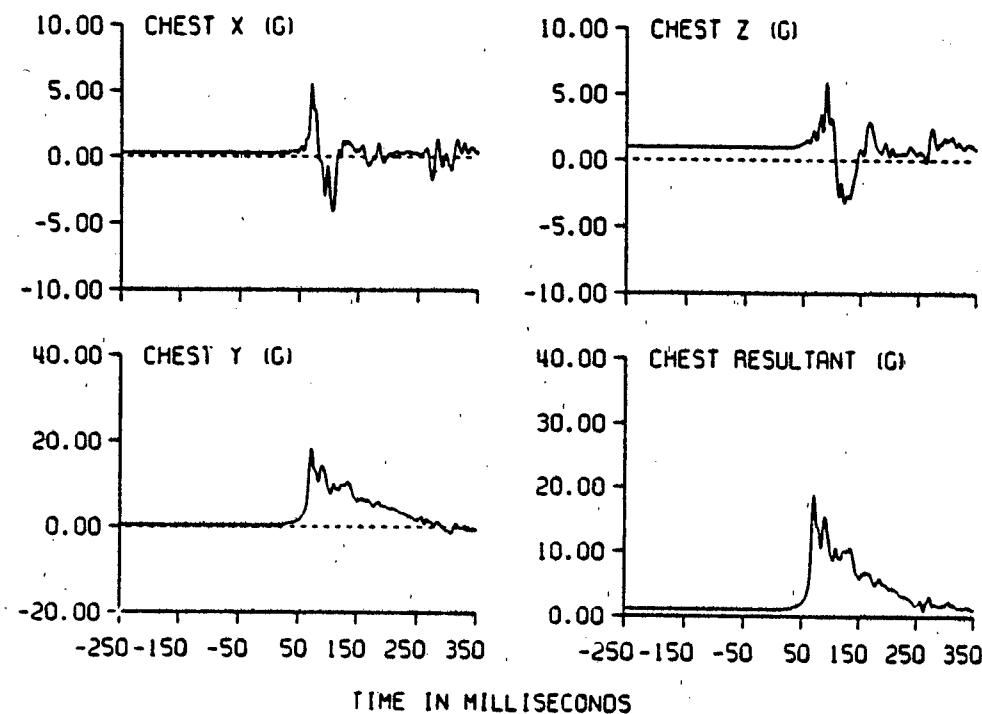
CHIA STUDY •GY TEST: 3484 SUBJ: ADAM-S CELL: A



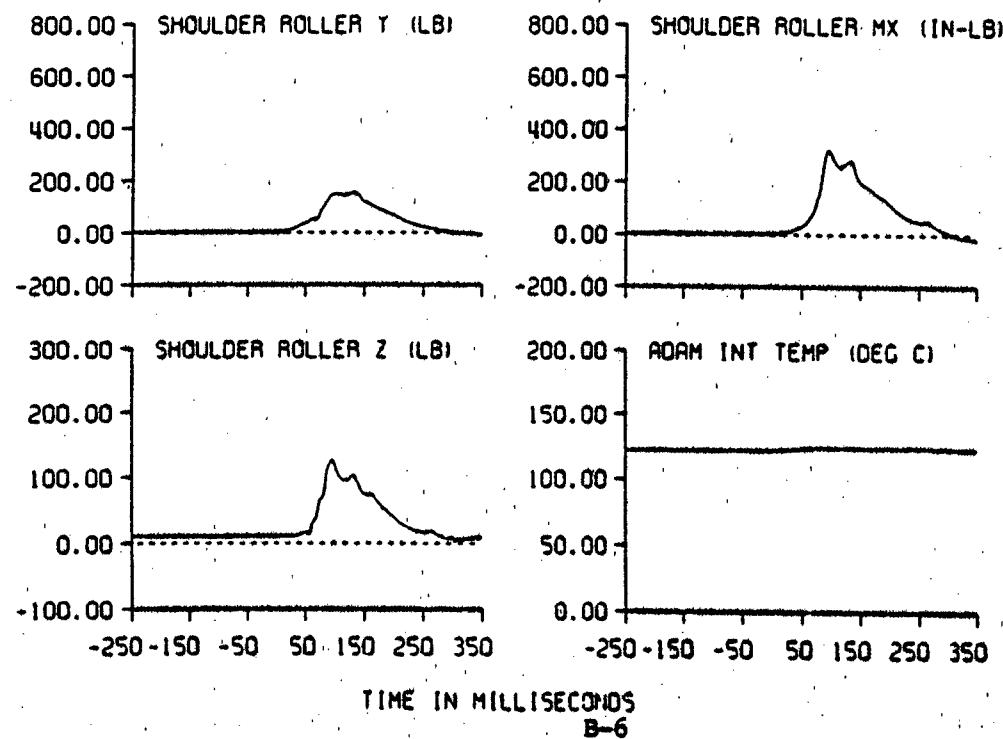
CHIA STUDY •GY TEST: 3484 SUBJ: ADAM-S CELL: A



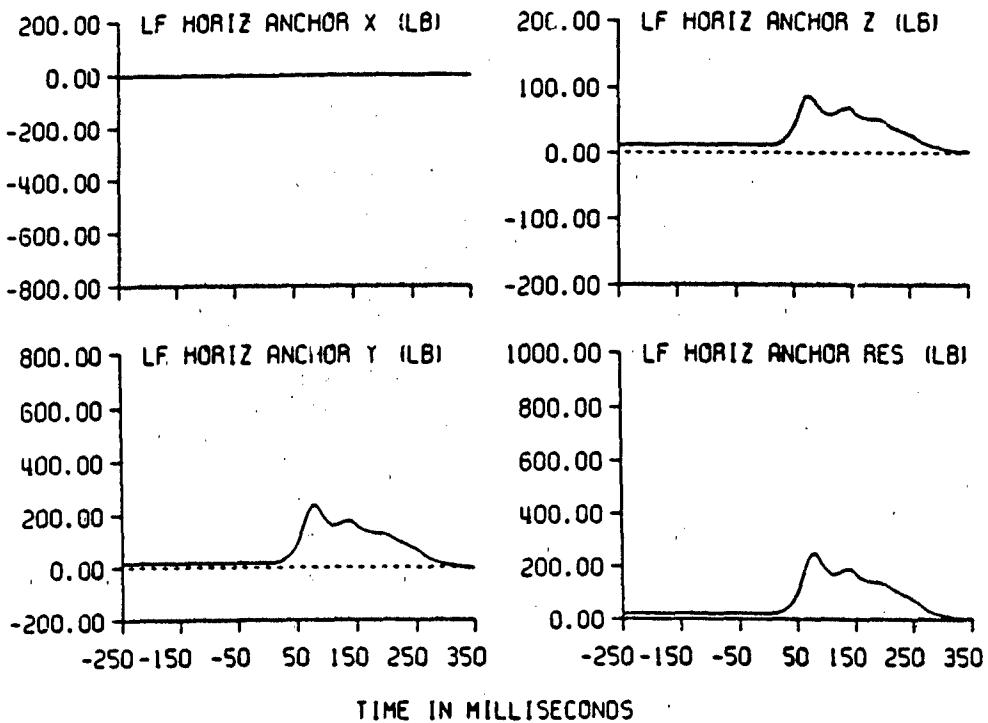
CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S CELL: A



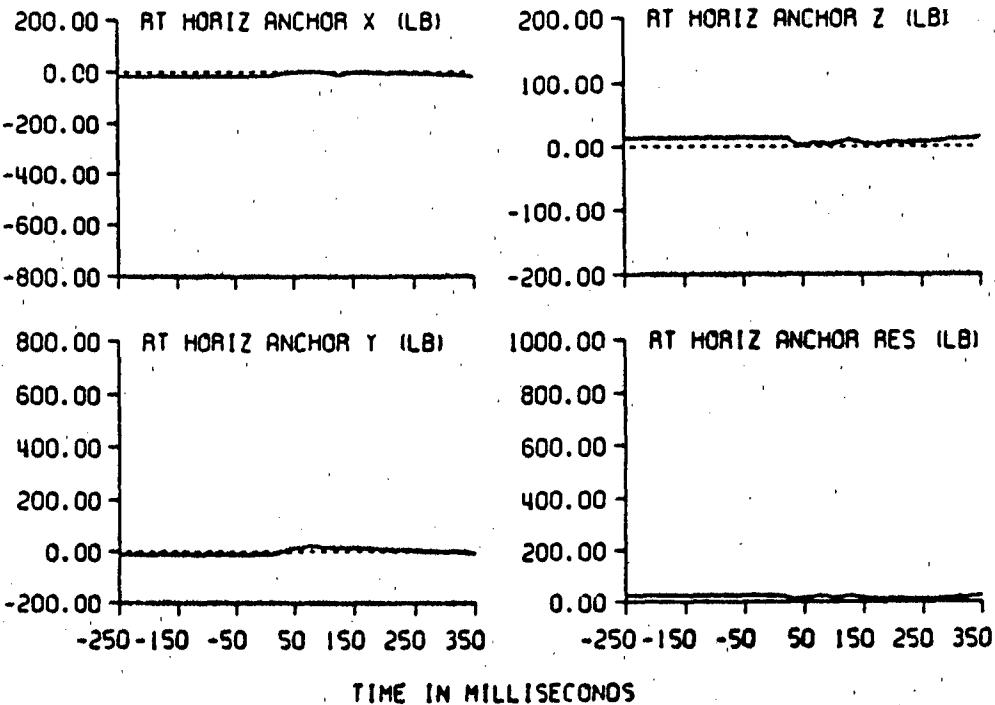
CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S CELL: A



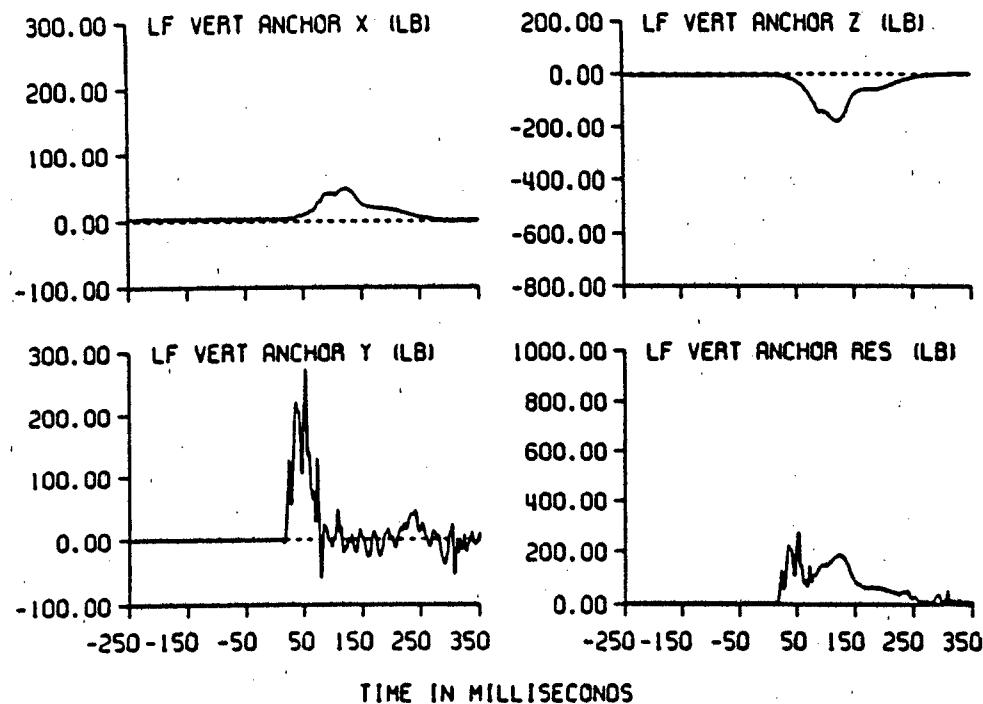
CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S CELL: A



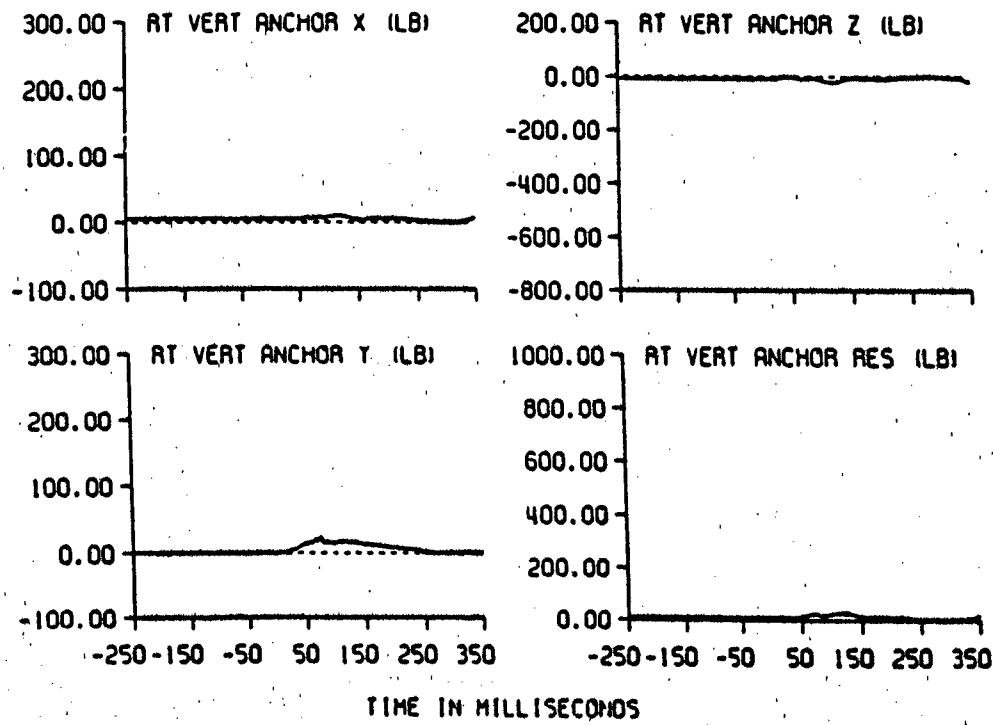
CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S CELL: A



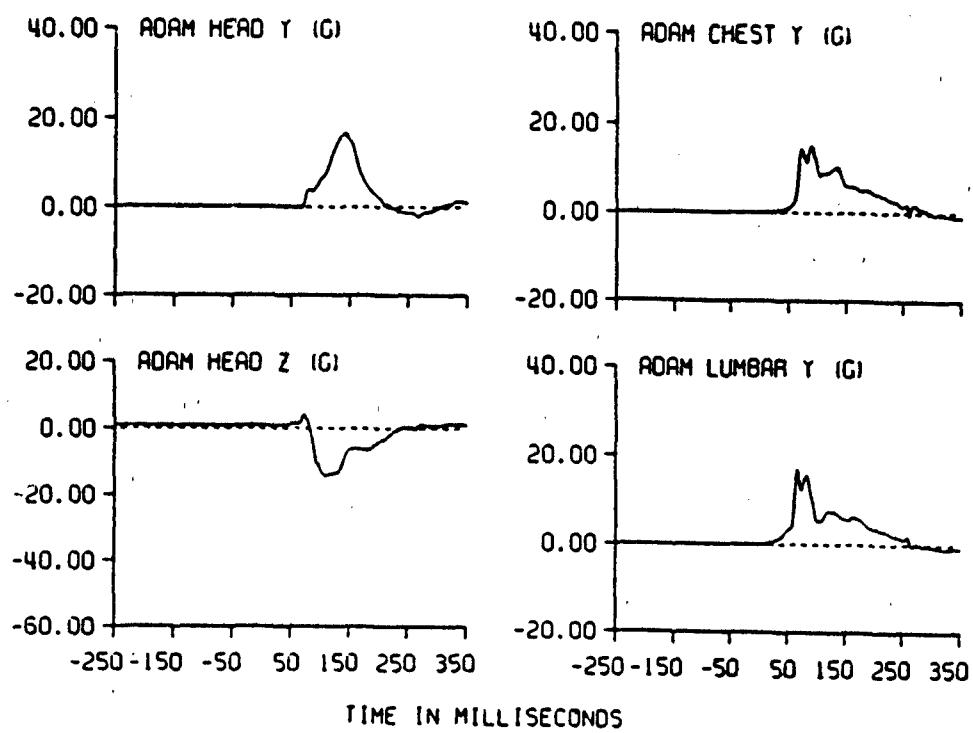
CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S CELL: A



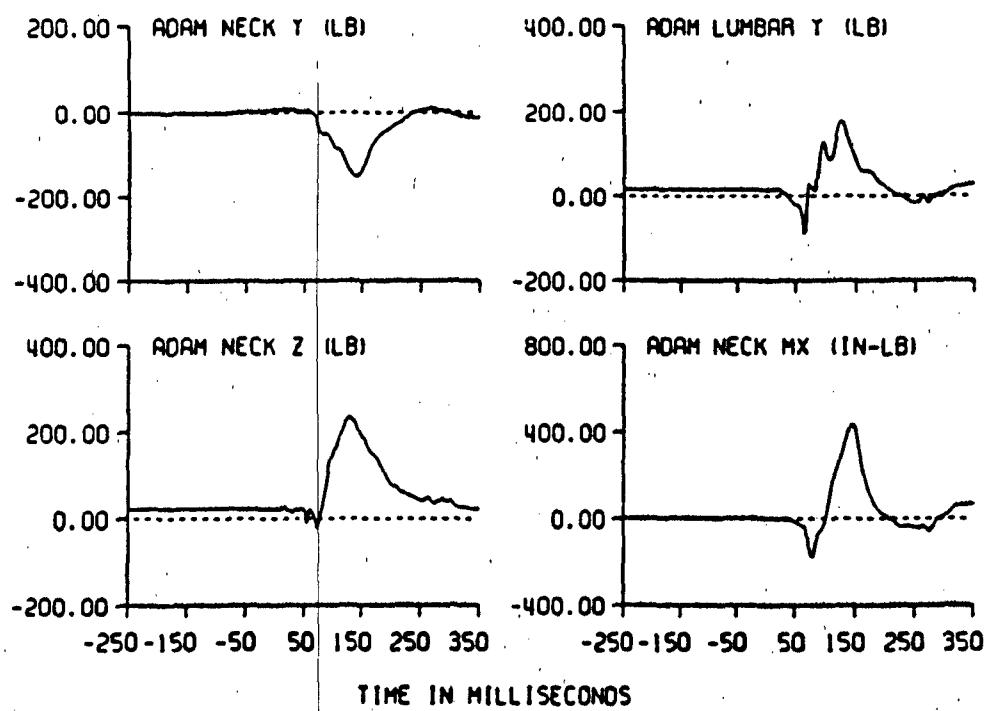
CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S CELL: A



CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S CELL: A



CHIA STUDY +GY TEST: 3484 SUBJ: ADAM-S CELL: A



CHIA STUDY +GY TEST: 3485 SUBJ: ADAM-L WT: 216.0 NOM G: 8.0 CELL: A

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -265. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 86. | 265. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 9. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.48 | -1.21 | 70. | 62. |
| Y AXIS | 0.02 | 7.98 | -0.44 | 69. | 282. |
| Z AXIS | 0.98 | 1.43 | 0.42 | 80. | 60. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.34 | 1.66 | -1.80 | 69. | 61. |
| Y AXIS | -0.02 | 12.60 | -0.83 | 84. | 298. |
| Z AXIS | 0.94 | 2.53 | -0.77 | 61. | 55. |
| RESULTANT | 1.00 | 12.67 | 0.68 | 84. | 295. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.21 | 7.21 | -8.47 | 79. | 97. |
| Y AXIS | 0.21 | 20.41 | -3.76 | 78. | 273. |
| Z AXIS | 0.97 | 6.47 | -7.06 | 75. | 112. |
| RESULTANT | 1.02 | 22.21 | 0.52 | 78. | 316. |
| RY (RAD/SEC2) | 1.23 | 1803.02 | -2392.55 | 86. | 97. |
| SLED VELOCITY (PPS) | 0.03 | 42.13 | 0.00 | 261. | 3. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -8.31 | 5.97 | -29.38 | 53. | 173. |
| LEFT Y AXIS | 4.65 | 49.50 | 2.30 | 91. | 294. |
| LEFT Z AXIS | 6.66 | 10.28 | 2.25 | 60. | 55. |
| LEFT RESULTANT | 11.64 | 53.66 | 5.43 | 91. | 296. |
| RIGHT X AXIS | -10.55 | 1.38 | -374.17 | 325. | 101. |
| RIGHT Y AXIS | 1.98 | 90.56 | -0.58 | 91. | 295. |
| RIGHT Z AXIS | 1.33 | 4.85 | -9.11 | 60. | 103. |
| RIGHT RESULTANT | 10.84 | 381.97 | 0.86 | 101. | 340. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -0.49 | 279.38 | -6.57 | 95. | 331. |
| Z AXIS FORCE (LB) | 8.89 | 148.73 | -0.17 | 97. | 296. |
| X AXIS TORQUE (IN-LB) | 8.20 | 409.98 | -8.09 | 96. | 330. |

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CHIA STUDY +GY TEST: 3485 SUBJ: ADAM-L WT: 216.0 NOM G: 8.0 CELL: A

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -10.48 | -1.47 | -282.61 | 332. | 104. |
| LEFT HORIZ Y AXIS | 10.75 | 181.15 | 2.05 | 85. | 333. |
| LEFT HORIZ Z AXIS | 11.68 | 80.15 | 2.67 | 100. | 327. |
| LEFT RESULTANT | 19.03 | 336.30 | 3.67 | 103. | 337. |
| RIGHT HORIZ X AXIS | -15.00 | 2.90 | -29.90 | 73. | 340. |
| RIGHT HORIZ Y AXIS | -11.07 | 54.27 | -10.80 | 83. | 1. |
| RIGHT HORIZ Z AXIS | 17.15 | 21.80 | -1.75 | 337. | 79. |
| RIGHT RESULTANT | 25.35 | 54.37 | 9.68 | 85. | 31. |
| LEFT VERT X AXIS | 2.54 | 33.19 | 0.34 | 94. | 55. |
| LEFT VERT Y AXIS | -0.85 | 115.71 | -3.79 | 98. | 303. |
| LEFT VERT Z AXIS | -2.24 | 1.83 | -335.40 | 313. | 102. |
| LEFT RESULTANT | 3.56 | 354.91 | 2.72 | 102. | 2. |
| RIGHT VERT X AXIS | 4.82 | 28.84 | -0.04 | 107. | 278. |
| RIGHT VERT Y AXIS | 0.52 | 32.42 | -2.07 | 84. | 329. |
| RIGHT VERT Z AXIS | -7.66 | 1.87 | -52.81 | 270. | 108. |
| RIGHT RESULTANT | 9.16 | 64.09 | 1.39 | 109. | 278. |
| ADAM INTERNAL TEMP (DEG C) | 114.39 | 114.50 | 112.50 | 0. | 269. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | -0.01 | 15.94 | -2.98 | 127. | 49. |
| HEAD Z AXIS | 1.01 | 2.80 | -18.97 | 75. | 105. |
| CHEST Y AXIS | 0.03 | 18.49 | -0.36 | 97. | 269. |
| LUKBAR Y AXIS | 0.08 | 22.46 | -0.79 | 77. | 333. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | -0.58 | 20.43 | -176.30 | 53. | 130. |
| NECK Z AXIS | -7.02 | 192.75 | -58.38 | 105. | 53. |
| LUKBAR Y AXIS | 2.41 | 262.98 | -82.37 | 80. | 69. |
| ADAM NECK MX TORQUE (IN-LB) | -1.40 | 561.02 | -153.53 | 125. | 80. |

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CHIA STUDY +GY TEST: 3486 SUBJ: ADAM-L WT: 216.0 NOM G: 11.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -244. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 1. | 46. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 1. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.03 | 0.54 | -1.51 | 341. | 56. |
| Y AXIS | 0.00 | 11.27 | -0.64 | 100. | 235. |
| Z AXIS | 0.96 | 1.73 | -0.07 | 234. | 54. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.21 | 2.48 | -2.47 | 65. | 53. |
| Y AXIS | -0.02 | 17.80 | -1.34 | 77. | 253. |
| Z AXIS | 0.92 | 2.84 | -1.37 | 55. | 50. |
| RESULTANT | 0.94 | 18.04 | 0.59 | 77. | 357. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.19 | 9.97 | -20.00 | 78. | 92. |
| Y AXIS | 0.19 | 31.66 | -3.57 | 74. | 347. |
| Z AXIS | 1.00 | 6.46 | -8.82 | 71. | 106. |
| RESULTANT | 1.04 | 35.30 | 0.37 | 92. | 256. |
| RY (RAD/SEC2) | -8.61 | 2481.57 | -2871.79 | 83. | 92. |
| SLED VELOCITY (PPS) | 0.01 | 52.05 | 0.01 | 241. | 0. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -9.58 | 6.21 | -64.50 | 48. | 146. |
| LEFT Y AXIS | 2.91 | 68.66 | -0.41 | 86. | 248. |
| LEFT Z AXIS | 5.22 | 12.94 | -0.83 | 77. | 50. |
| LEFT RESULTANT | 11.31 | 76.30 | 4.22 | 84. | 239. |
| RIGHT X AXIS | -9.29 | 4.55 | -481.70 | 355. | 95. |
| RIGHT Y AXIS | 1.14 | 129.63 | -1.24 | 88. | 286. |
| RIGHT Z AXIS | 0.72 | 4.72 | -14.31 | 55. | 92. |
| RIGHT RESULTANT | 9.41 | 494.00 | 0.69 | 95. | 295. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -1.27 | 389.54 | -15.42 | 91. | 333. |
| Z AXIS FORCE (LB) | 6.07 | 150.74 | -2.81 | 77. | 346. |
| X AXIS TORQUE (IN-LB) | 2.62 | 458.95 | -19.24 | 90. | 312. |

CHIA STUDY +GY TEST: 3486 SUBJ: ADAM-L VT: 216.0 NOM G: 11.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -11.53 | 0.06 | -413.85 | 354. | 98. |
| LEFT HORIZ Y AXIS | 2.23 | 246.74 | -1.91 | 76. | 311. |
| LEFT HORIZ Z AXIS | 9.56 | 97.23 | -0.07 | 96. | 357. |
| LEFT RESULTANT | 15.19 | 479.77 | 1.51 | 98. | 357. |
| RIGHT HORIZ X AXIS | -12.43 | 9.37 | -62.48 | 61. | 357. |
| RIGHT HORIZ Y AXIS | -12.59 | 71.89 | -19.55 | 76. | 336. |
| RIGHT HORIZ Z AXIS | 13.18 | 38.29 | -12.18 | 348. | 64. |
| RIGHT RESULTANT | 22.07 | 75.41 | 7.79 | 358. | 24. |
| LEFT VERT X AXIS | 1.17 | 43.89 | -2.34 | 83. | 52. |
| LEFT VERT Y AXIS | 1.86 | 188.20 | -2.49 | 97. | 289. |
| LEFT VERT Z AXIS | -2.73 | 2.19 | -487.40 | 329. | 99. |
| LEFT RESULTANT | 3.61 | 523.30 | 2.29 | 99. | 278. |
| RIGHT VERT X AXIS | 1.81 | 39.77 | -3.54 | 100. | 280. |
| RIGHT VERT Y AXIS | -0.38 | 42.73 | -3.83 | 81. | 348. |
| RIGHT VERT Z AXIS | -6.19 | 0.00 | -128.65 | 35. | 101. |
| RIGHT RESULTANT | 6.47 | 140.76 | 0.39 | 101. | 243. |
| ADAM INTERNAL TEMP (DEG C) | 108.81 | 105.00 | 108.00 | 0. | 28. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | -0.04 | 22.73 | -2.26 | 127. | 353. |
| HEAD Z AXIS | 1.06 | 4.18 | -33.30 | 71. | 99. |
| CHEST Y AXIS | 0.11 | 26.30 | -2.63 | 89. | 345. |
| LUMBAR Y AXIS | 0.15 | 34.88 | -2.06 | 72. | 336. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | -0.25 | 29.71 | -255.14 | 355. | 123. |
| NECK Z AXIS | 8.66 | 369.83 | -19.90 | 100. | 50. |
| LUMBAR Y AXIS | -5.09 | 378.91 | -173.67 | 78. | 66. |
| ADAM NECK MX TORQUE (IN-LB) | -4.14 | 768.99 | -296.99 | 117. | 76. |

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CHIA STUDY +GY TEST: 3487 SUBJ: ADAM-L VT: 216.0 NOM G: 14.0 CELL: C

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -263. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 175. | 96. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 19. | 33. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.79 | -1.81 | 58. | 51. |
| Y AXIS | 0.03 | 14.35 | -0.60 | 90. | 213. |
| Z AXIS | 0.99 | 1.57 | 0.05 | 209. | 60. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.23 | 3.54 | -2.37 | 60. | 50. |
| Y AXIS | 0.01 | 24.88 | -1.61 | 67. | 307. |
| Z AXIS | 0.94 | 4.31 | -2.41 | 67. | 62. |
| RESULTANT | 0.97 | 25.27 | 0.77 | 67. | 301. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.23 | 10.32 | -23.37 | 71. | 82. |
| Y AXIS | 0.16 | 36.68 | -4.38 | 68. | 319. |
| Z AXIS | 1.06 | 8.70 | -12.48 | 86. | 100. |
| RESULTANT | 1.10 | 40.98 | 0.80 | 80. | 238. |
| RY (RAD/SEC2) | -7.16 | 3489.89 | -4179.06 | 96. | 88. |
| SLED VELOCITY (FPS) | 0.02 | 59.94 | 0.03 | 219. | 0. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -8.63 | 5.34 | -83.04 | 44. | 124. |
| LEFT Y AXIS | 1.17 | 85.16 | -4.63 | 76. | 306. |
| LEFT Z AXIS | 3.03 | 14.64 | -4.86 | 68. | 62. |
| LEFT RESULTANT | 9.24 | 105.03 | 3.21 | 77. | 215. |
| RIGHT X AXIS | -7.63 | 4.15 | -470.23 | 315. | 86. |
| RIGHT Y AXIS | 0.99 | 143.28 | -2.78 | 77. | 304. |
| RIGHT Z AXIS | 0.59 | 3.17 | -20.93 | 50. | 88. |
| RIGHT RESULTANT | 7.75 | 483.36 | 0.80 | 86. | 278. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -2.66 | 432.48 | -20.43 | 80. | 311. |
| Z AXIS FORCE (LB) | 4.26 | 128.39 | -1.90 | 74. | 228. |
| X AXIS TORQUE (IN-LB) | -1.55 | 413.37 | -29.29 | 86. | 284. |

CHIA STUDY +GY TEST: 3487 SUBJ: ADAM-L WT: 216.0 NOM G: 14.0 CELL: C

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -9.89 | 0.69 | -411.66 | 285. | 91. |
| LEFT HORIZ Y AXIS | 7.32 | 234.78 | -3.44 | 68. | 306. |
| LEFT HORIZ Z AXIS | 9.29 | 95.57 | -1.73 | 85. | 319. |
| LEFT RESULTANT | 15.44 | 471.38 | 0.69 | 89. | 285. |
| RIGHT HORIZ X AXIS | -15.56 | 7.81 | -79.66 | 56. | 320. |
| RIGHT HORIZ Y AXIS | -11.48 | 93.69 | -38.20 | 67. | 314. |
| RIGHT HORIZ Z AXIS | 17.80 | 53.06 | -0.77 | 318. | 56. |
| RIGHT RESULTANT | 26.29 | 102.41 | 13.51 | 320. | 23. |
| LEPT VERT X AXIS | | | | | |
| LEPT VERT Y AXIS | 0.14 | 39.03 | 0.10 | 70. | 0. |
| LEPT VERT Z AXIS | -0.02 | 265.82 | -4.96 | 85. | 311. |
| LEPT RESULTANT | -0.93 | 4.23 | -692.58 | 296. | 93. |
| RIGHT VERT X AXIS | 1.24 | 738.59 | 0.23 | 94. | 0. |
| RIGHT VERT Y AXIS | 0.54 | 52.94 | -3.00 | 93. | 278. |
| RIGHT VERT Z AXIS | 0.76 | 55.87 | -6.21 | 92. | 337. |
| RIGHT RESULTANT | -3.29 | 3.02 | -186.73 | 259. | 95. |
| RIGHT RESULTANT | 3.46 | 200.59 | 0.94 | 95. | 1. |
| ADAM INTERNAL TEMP (DEG C) | 108.62 | 109.00 | 107.25 | 102. | 70. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | -0.06 | 27.57 | -4.04 | 117. | 222. |
| HEAD Z AXIS | 1.02 | 5.47 | -48.34 | 64. | 91. |
| CHEST Y AXIS | -0.07 | 29.59 | -4.10 | 80. | 297. |
| LUMBAR Y AXIS | 0.09 | 45.20 | -3.59 | 63. | 304. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | 2.94 | 40.95 | -332.04 | 215. | 116. |
| NECK Z AXIS | -3.54 | 518.72 | -39.80 | 92. | 64. |
| LUMBAR Y AXIS | -0.32 | 508.84 | -320.02 | 87. | 59. |
| ADAM NECK MX TORQUE (IN-LB) | -8.01 | 965.16 | -413.20 | 120. | 70. |

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CHIA STUDY +GY TEST: 3489 SUBJ: ADAM-L WT: 216.0 NOM G: 11.0 CELL: E

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -284. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.49 | 219. | 300. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 2. | 46. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.28 | -1.45 | 65. | 58. |
| Y AXIS | 0.01 | 11.07 | -0.59 | 98. | 237. |
| Z AXIS | 0.98 | 1.72 | 0.24 | 82. | 63. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.23 | 2.12 | -2.58 | 101. | 58. |
| Y AXIS | -0.01 | 15.04 | -0.72 | 85. | 240. |
| Z AXIS | 0.94 | 2.03 | -1.42 | 60. | 65. |
| RESULTANT | 0.97 | 15.09 | 0.54 | 85. | 269. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.14 | 12.18 | -13.28 | 79. | 94. |
| Y AXIS | 0.18 | 35.21 | -3.24 | 78. | 221. |
| Z AXIS | 1.04 | 11.50 | -9.34 | 78. | 107. |
| RESULTANT | 1.07 | 38.81 | 0.96 | 78. | 16. |
| RY (RAD/SEC2) | -6.38 | 2950.27 | -3427.14 | 86. | 96. |
| SLED VELOCITY (FPS) | 0.01 | 51.93 | 0.02 | 234. | 0. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -8.16 | 3.85 | -70.79 | 66. | 144. |
| LEFT Y AXIS | 3.45 | 55.30 | 0.05 | 88. | 320. |
| LEFT Z AXIS | 4.93 | 11.81 | 1.49 | 143. | 65. |
| LEFT RESULTANT | 10.15 | 79.66 | 8.50 | 144. | 3. |
| RIGHT X AXIS | -7.42 | 0.71 | -564.60 | 296. | 86. |
| RIGHT Y AXIS | 1.68 | 136.60 | -1.29 | 87. | 277. |
| RIGHT Z AXIS | 1.15 | 3.78 | -13.98 | 60. | 90. |
| RIGHT RESULTANT | 7.72 | 580.68 | 0.72 | 86. | 298. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -1.82 | 479.23 | -10.98 | 86. | 277. |
| Z AXIS FORCE (LB) | 7.79 | 328.24 | 1.60 | 84. | 320. |
| X AXIS TORQUE (IN-LB) | 4.76 | 898.50 | -19.62 | 85. | 284. |

CHIA STUDY +GY TEST: 3489 SUBJ: ADAM-L WT: 216.0 NOM G: 11.0 CELL: E

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -17.35 | 3.31 | -116.96 | 275. | 93. |
| LEFT HORIZ Y AXIS | -2.17 | 86.18 | -16.42 | 82. | 307. |
| LEFT HORIZ Z AXIS | 0.63 | 3.67 | -43.17 | 284. | 91. |
| LEFT RESULTANT | 17.53 | 141.43 | 0.79 | 92. | 253. |
| RIGHT HORIZ X AXIS | -15.65 | 9.34 | -148.41 | 199. | 97. |
| RIGHT HORIZ Y AXIS | 2.71 | 219.01 | -4.33 | 64. | 305. |
| RIGHT HORIZ Z AXIS | 1.65 | 11.74 | -67.33 | 71. | 104. |
| RIGHT RESULTANT | 15.97 | 258.63 | 3.72 | 64. | 259. |
| | | | | | |
| LEFT VERT X AXIS | -0.28 | 1.27 | -54.69 | 292. | 89. |
| LEFT VERT Y AXIS | 0.00 | 167.86 | -2.49 | 92. | 305. |
| LEFT VERT Z AXIS | -0.60 | 1.75 | -583.33 | 277. | 93. |
| LEFT RESULTANT | 0.89 | 609.35 | 0.29 | 93. | 1. |
| RIGHT VERT X AXIS | -1.23 | 0.43 | -8.59 | 24. | 57. |
| RIGHT VERT Y AXIS | 0.17 | 29.35 | -1.69 | 56. | 236. |
| RIGHT VERT Z AXIS | -0.52 | 2.57 | -19.94 | 222. | 104. |
| RIGHT RESULTANT | 1.59 | 34.43 | 0.78 | 104. | 253. |
| | | | | | |
| ADAM INTERNAL TEMP (DEG C) | 105.48 | 106.00 | 104.75 | 54. | 77. |
| | | | | | |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | -0.13 | 20.95 | -2.94 | 122. | 60. |
| HEAD Z AXIS | 1.02 | 2.35 | -34.93 | 312. | 97. |
| CHEST Y AXIS | -0.03 | 27.27 | -2.21 | 78. | 319. |
| LUMBAR Y AXIS | 0.10 | 23.03 | -1.53 | 63. | 302. |
| | | | | | |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | 1.87 | 35.16 | -251.27 | 60. | 120. |
| NECK Z AXIS | -2.16 | 340.38 | -12.30 | 96. | 50. |
| LUMBAR Y AXIS | -3.27 | 50.24 | -531.93 | 106. | 67. |
| | | | | | |
| ADAM NECK MX TORQUE (IN-LB) | -6.60 | 714.72 | -308.31 | 125. | 76. |

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CHIA STUDY +GY TEST: 3490 SUBJ: ADAM-L WT: 216.0 NOM G: 14.0 CELL: F

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -276. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 4. | 12. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 74. | 4. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.49 | -1.81 | 61. | 53. |
| Y AXIS | 0.03 | 14.54 | -0.56 | 89. | 213. |
| Z AXIS | 1.01 | 2.34 | -0.24 | 71. | 62. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.27 | 3.24 | -3.54 | 85. | 54. |
| Y AXIS | -0.01 | 24.02 | -1.66 | 66. | 298. |
| Z AXIS | 0.90 | 2.99 | -3.25 | 68. | 63. |
| RESULTANT | 0.94 | 24.08 | 0.59 | 66. | 208. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.25 | 7.67 | -10.50 | 67. | 80. |
| Y AXIS | 0.38 | 32.09 | -4.14 | 84. | 310. |
| Z AXIS | 1.23 | 7.76 | -10.01 | 76. | 102. |
| RESULTANT | 1.31 | 33.10 | 0.62 | 84. | 225. |
| RY (RAD/SEC2) | -11.25 | 2397.66 | -1755.87 | 72. | 81. |
| SLED VELOCITY (FPS) | 0.04 | 59.80 | 0.08 | 213. | 0. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -8.88 | 4.87 | -87.44 | 62. | 131. |
| LEFT Y AXIS | 1.65 | 70.41 | -5.57 | 74. | 295. |
| LEFT Z AXIS | 4.14 | 13.72 | -3.49 | 129. | 63. |
| LEFT RESULTANT | 9.97 | 97.66 | 9.82 | 131. | 7. |
| RIGHT X AXIS | -10.10 | 4.27 | -598.59 | 296. | 88. |
| RIGHT Y AXIS | 2.00 | 140.24 | -4.65 | 76. | 295. |
| RIGHT Z AXIS | 0.37 | 2.56 | -15.20 | 57. | 63. |
| RIGHT RESULTANT | 10.33 | 612.43 | 0.32 | 89. | 267. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 0.00 | 477.78 | -23.09 | 104. | 294. |
| Z AXIS FORCE (LB) | 11.11 | 294.05 | 6.50 | 82. | 259. |
| X AXIS TORQUE (IN-LB) | 7.20 | 837.67 | -39.46 | 85. | 284. |

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CHIA STUDY +GY TRST: 3490 SUBJ: ADAM-L WT: 216.0 NOM G: 14.0 CELL: P

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HGRIZ X AXIS | -15.88 | 20.65 | -162.10 | 309. | 82. |
| LEFT HGRIZ Y AXIS | -9.43 | 118.24 | -48.69 | 69. | 302. |
| LEFT HGRIZ Z AXIS | -3.21 | 2.20 | -59.06 | 251. | 77. |
| LEFT RESULTANT | 18.77 | 200.08 | 3.12 | 85. | 235. |
| RIGHT HGRIZ X AXIS | -14.14 | 15.71 | -335.72 | 215. | 60. |
| RIGHT HGRIZ Y AXIS | 5.73 | 323.15 | -12.73 | 61. | 292. |
| RIGHT HGRIZ Z AXIS | -1.44 | 2.12 | -145.93 | 259. | 96. |
| RIGHT RESULTANT | 15.36 | 462.81 | 13.24 | 61. | 237. |
| | | | | | |
| LEFT VERT X AXIS | -0.80 | 1.63 | -68.93 | 288. | 97. |
| LEFT VERT Y AXIS | -0.07 | 216.09 | -2.57 | 86. | 258. |
| LEFT VERT Z AXIS | -1.09 | 2.03 | -731.34 | 244. | 85. |
| LEFT RESULTANT | 1.57 | 764.78 | 0.41 | 85. | 242. |
| RIGHT VERT X AXIS | 0.21 | 1.05 | -20.61 | 1. | 95. |
| RIGHT VERT Y AXIS | 0.07 | 56.97 | -1.66 | 101. | 222. |
| RIGHT VERT Z AXIS | -0.46 | 2.51 | -106.84 | 236. | 99. |
| RIGHT RESULTANT | 1.28 | 119.95 | 1.04 | 99. | 0. |
| | | | | | |
| ADAM INTERNAL TEMP (DEG C) | 102.69 | 103.26 | 101.76 | 47. | 66. |
| | | | | | |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | 0.09 | 24.15 | -2.50 | 118. | 224. |
| HEAD Z AXIS | 0.99 | 5.52 | -39.42 | 292. | 91. |
| CHEST Y AXIS | 0.18 | 28.56 | -2.56 | 79. | 287. |
| LUMBAR Y AXIS | 0.10 | 36.20 | -3.14 | 61. | 291. |
| | | | | | |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | -2.13 | 25.59 | -287.59 | 224. | 116. |
| NECK Z AXIS | -3.07 | 400.49 | -42.76 | 91. | 292. |
| LUMBAR Y AXIS | 8.19 | 236.66 | -365.25 | 101. | 59. |
| | | | | | |
| ADAM NECK MX TORQUE (IN-LB) | 0.36 | 800.07 | -250.29 | 113. | 67. |

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CHIA STUDY +GY TEST: 3491 SUBJ: ADAM-S WT: 143.0 NOM G: 8.0 CELL: D

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -328. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 33. | 71. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 154. | 0. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | 0.00 | 0.22 | -1.10 | 54. | 64. |
| Y AXIS | 0.03 | 8.11 | -0.46 | 95. | 279. |
| Z AXIS | 1.03 | 1.70 | 0.17 | 79. | 84. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.26 | 2.54 | -2.29 | 98. | 64. |
| Y AXIS | -0.03 | 13.13 | -0.41 | 83. | 265. |
| Z AXIS | 0.92 | 3.02 | -0.79 | 93. | 50. |
| RESULTANT | 0.95 | 13.17 | 0.70 | 83. | 274. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.19 | 6.72 | -3.22 | 65. | 107. |
| Y AXIS | 0.35 | 22.10 | 0.15 | 67. | 277. |
| Z AXIS | 1.17 | 3.22 | -1.59 | 183. | 117. |
| RESULTANT | 1.24 | 22.91 | 1.15 | 66. | 4. |
| RY (RAD/SEC2) | -11.55 | 823.22 | -686.12 | 72. | 222. |
| SLED VELOCITY (PPS) | 0.00 | 41.99 | -0.01 | 259. | 1. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -3.15 | 8.56 | -15.01 | 100. | 66. |
| LEFT Y AXIS | 6.56 | 40.61 | 6.08 | 81. | 3. |
| LEFT Z AXIS | 7.71 | 12.43 | 3.26 | 81. | 51. |
| LEFT RESULTANT | 10.62 | 42.79 | 9.07 | 81. | 260. |
| RIGHT X AXIS | -3.12 | 0.00 | -256.96 | 273. | 95. |
| RIGHT Y AXIS | 1.13 | 55.20 | 0.28 | 88. | 270. |
| RIGHT Z AXIS | 1.87 | 5.58 | -2.03 | 81. | 51. |
| RIGHT RESULTANT | 3.90 | 260.24 | 1.54 | 95. | 273. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -1.29 | 209.87 | -3.27 | 90. | 274. |
| Z AXIS FORCE (LB) | 4.56 | 171.06 | -3.89 | 93. | 276. |
| X AXIS TORQUE (IN-LB) | 1.42 | 460.59 | -1.20 | 95. | 275. |

CHIA STUDY +GY TEST: 3491 SUBJ: ADAM-S WT: 143.0 NOM G: 8.0 CELL: D

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -1.37 | 0.37 | -118.33 | 13. | 84. |
| LEFT HORIZ Y AXIS | -1.46 | 162.86 | -0.59 | 80. | 0. |
| LEFT HORIZ Z AXIS | 1.30 | 3.24 | -38.20 | 5. | 86. |
| LEFT RESULTANT | 2.56 | 200.23 | 1.69 | 80. | 10. |
| RIGHT HORIZ X AXIS | -6.22 | 15.65 | -32.77 | 58. | 79. |
| RIGHT HORIZ Y AXIS | -0.17 | 151.13 | -0.11 | 77. | 0. |
| RIGHT HORIZ Z AXIS | -0.81 | -0.10 | -57.30 | 0. | 80. |
| RIGHT RESULTANT | 6.33 | 162.09 | 4.66 | 77. | 4. |
| LEFT VERT X AXIS | | | | | |
| LEFT VERT Y AXIS | -2.99 | -1.78 | -26.11 | 276. | 88. |
| LEFT VERT Z AXIS | -0.03 | 115.66 | -0.03 | 78. | 0. |
| LEFT RESULTANT | -6.30 | -6.30 | -308.99 | 0. | 89. |
| RIGHT VERT X AXIS | 6.97 | 326.34 | 6.97 | 89. | 0. |
| RIGHT VERT Y AXIS | -2.20 | -0.33 | -9.35 | 20. | 110. |
| RIGHT VERT Z AXIS | 0.38 | 33.14 | -1.35 | 80. | 4. |
| RIGHT RESULTANT | -5.20 | -1.61 | -33.77 | 12. | 73. |
| RIGHT RESULTANT | 5.68 | 45.70 | 3.40 | 80. | 12. |
| ADAM INTERNAL TEMP (DEG C) | 118.70 | 119.85 | 118.11 | 129. | 54. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | 0.06 | 14.59 | -0.98 | 129. | 263. |
| HEAD Z AXIS | 0.91 | 4.15 | -14.42 | 66. | 92. |
| CHEST Y AXIS | 0.29 | 17.39 | 0.32 | 79. | 0. |
| LUMBAR Y AXIS | -0.15 | 23.13 | -0.31 | 73. | 271. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | -4.76 | -2.13 | -121.85 | 51. | 130. |
| NECK Z AXIS | -27.44 | 133.51 | -64.35 | 93. | 51. |
| LUMBAR Y AXIS | 5.84 | 341.33 | -1713.05 | 84. | 69. |
| ADAM NECK MX TORQUE (IN-LB) | 43.42 | 311.26 | -102.59 | 136. | 70. |

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CHIA STUDY +GY TEST: 3492 SUBJ: ADAM-S WT: 143.0 NOM G: 11.0 CELL: E

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -319. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 66. | 2. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 258. | 56. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | 0.00 | 0.28 | -1.19 | 68. | 61. |
| Y AXIS | 0.02 | 11.11 | -0.51 | 83. | 236. |
| Z AXIS | 0.98 | 1.46 | 0.03 | 72. | 89. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.24 | 2.23 | -2.28 | 87. | 62. |
| Y AXIS | -0.01 | 17.25 | -0.74 | 66. | 240. |
| Z AXIS | 0.95 | 3.35 | -1.23 | 83. | 101. |
| RESULTANT | 0.98 | 17.30 | 0.71 | 66. | 252. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.19 | 6.85 | -5.72 | 79. | 91. |
| Y AXIS | 0.11 | 25.94 | -0.92 | 81. | 286. |
| Z AXIS | 1.00 | 9.97 | -6.39 | 72. | 106. |
| RESULTANT | 1.02 | 26.53 | 0.76 | 80. | 278. |
| RY (RAD/SEC2) | -2.44 | 1631.38 | -2231.75 | 107. | 102. |
| SLED VELOCITY (PPS) | 0.01 | 51.35 | 0.00 | 231. | 1. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | 1.07 | 9.23 | -33.98 | 73. | 127. |
| LEFT Y AXIS | 3.35 | 47.45 | 0.25 | 70. | 230. |
| LEFT Z AXIS | 3.66 | 9.66 | -0.67 | 82. | 89. |
| LEFT RESULTANT | 5.15 | 51.68 | 3.40 | 127. | 231. |
| RIGHT X AXIS | -0.35 | 3.68 | -318.51 | 244. | 117. |
| RIGHT Y AXIS | 0.12 | 62.09 | -2.17 | 119. | 286. |
| RIGHT Z AXIS | 1.15 | 2.61 | -5.00 | 61. | 88. |
| RIGHT RESULTANT | 1.28 | 324.53 | 0.33 | 119. | 3. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 0.14 | 280.63 | -3.55 | 119. | 256. |
| Z AXIS FORCE (LB) | 0.92 | 220.33 | -1.15 | 120. | 243. |
| X AXIS TORQUE (IN-LB) | 1.84 | 516.38 | -2.79 | 118. | 272. |

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CHIA STUDY +GY TEST: 3492 SUBJ: ADAM-S WT: 143.0 NOM G: 11.0 CELL: E

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -1.99 | 3.65 | -177.53 | 272. | 124. |
| LEFT HORIZ Y AXIS | -1.81 | 156.50 | -3.48 | 122. | 275. |
| LEFT HORIZ Z AXIS | -0.37 | 1.98 | -55.68 | 288. | 120. |
| LEFT RESULTANT | 2.91 | 241.98 | 1.05 | 122. | 5. |
| RIGHT HORIZ X AXIS | -0.63 | 21.83 | -42.20 | 51. | 64. |
| RIGHT HORIZ Y AXIS | 1.86 | 430.88 | 0.03 | 58. | 272. |
| RIGHT HORIZ Z AXIS | -0.92 | -1.11 | -194.58 | 0. | 54. |
| RIGHT RESULTANT | 2.39 | 457.29 | 2.11 | 58. | 1. |
| LEFT VERT X AXIS | 0.02 | 6.01 | -12.24 | 71. | 111. |
| LEFT VERT Y AXIS | 0.24 | 153.67 | -1.42 | 110. | 260. |
| LEFT VERT Z AXIS | -1.70 | 1.58 | -416.91 | 267. | 116. |
| LEFT RESULTANT | 1.90 | 443.06 | 0.48 | 116. | 0. |
| RIGHT VERT X AXIS | -0.87 | 3.65 | -3.57 | 73. | 287. |
| RIGHT VERT Y AXIS | 1.14 | 33.97 | -0.52 | 66. | 234. |
| RIGHT VERT Z AXIS | -2.16 | 0.19 | -22.32 | 16. | 110. |
| RIGHT RESULTANT | 2.98 | 35.26 | 0.55 | 66. | 234. |
| ADAM INTERNAL TEMP (DEG C) | 127.97 | 129.60 | 127.85 | 252. | 0. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | -0.05 | 24.92 | -2.73 | 125. | 225. |
| HEAD Z AXIS | 0.96 | 2.35 | -24.32 | 61. | 90. |
| CHEST Y AXIS | 0.04 | 24.80 | -0.60 | 78. | 277. |
| LUMBAR Y AXIS | -0.11 | 36.22 | -1.75 | 60. | 290. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | -4.02 | 9.18 | -193.43 | 238. | 125. |
| NECK Z AXIS | 3.76 | 371.36 | -6.12 | 123. | 60. |
| LUMBAR Y AXIS | -5.53 | 612.17 | -2182.26 | 112. | 59. |
| ADAM NECK MX TORQUE (IN-LB) | -23.73 | 604.69 | -290.65 | 128. | 72. |

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CHIA STUDY +GY TEST: 3493 SUBJ: ADAM-S WT: 143.0 NOM G: 14.0 CELL: F

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -286. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.50 | 166. | 133. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 211. | 144. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.03 | 0.32 | -1.38 | 78. | 57. |
| Y AXIS | 0.01 | 14.21 | -0.55 | 77. | 214. |
| Z AXIS | 0.96 | 1.48 | 0.02 | 211. | 84. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.24 | 2.46 | -2.20 | 80. | 58. |
| Y AXIS | -0.05 | 21.83 | -1.39 | 61. | 221. |
| Z AXIS | 0.90 | 3.95 | -0.87 | 76. | 84. |
| RESULTANT | 0.94 | 21.92 | 0.35 | 61. | 209. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.42 | 8.81 | -11.22 | 54. | 75. |
| Y AXIS | 0.29 | 28.92 | -2.25 | 73. | 284. |
| Z AXIS | 0.93 | 10.66 | -9.18 | 76. | 102. |
| RESULTANT | 1.06 | 32.01 | 0.70 | 74. | 257. |
| RY (RAD/SEC2) | -12.60 | 1835.20 | -1962.98 | 69. | 75. |
| SLED VELOCITY (FPS) | -0.01 | 59.72 | 0.00 | 219. | 1. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | 1.70 | 5.85 | -49.14 | 25. | 122. |
| LEFT Y AXIS | 2.74 | 66.15 | -1.77 | 66. | 217. |
| LEFT Z AXIS | 3.58 | 10.46 | 2.43 | 75. | 19. |
| LEFT RESULTANT | 4.87 | 68.20 | 2.96 | 122. | 273. |
| RIGHT X AXIS | -2.38 | 1.26 | -362.43 | 254. | 94. |
| RIGHT Y AXIS | 0.45 | 77.80 | -2.83 | 88. | 217. |
| RIGHT Z AXIS | 0.71 | 3.25 | -8.17 | 62. | 85. |
| RIGHT RESULTANT | 2.69 | 370.45 | 1.03 | 94. | 232. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -1.10 | 298.18 | -9.09 | 92. | 292. |
| Z AXIS FORCE (LB) | 0.71 | 234.47 | -2.83 | 92. | 240. |
| X AXIS TORQUE (IN-LB) | 2.90 | 563.06 | -16.23 | 93. | 318. |

CHIA STUDY +GY TEST: 3493 SUBJ: ADAM-S WT: 143.0 NOM G: 14.0 CELL: F

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -5.91 | 3.28 | -218.51 | 259. | 86. |
| LEFT HORIZ Y AXIS | -1.98 | 189.43 | -8.80 | 85. | 291. |
| LEFT HORIZ Z AXIS | -1.80 | 1.73 | -81.16 | 236. | 87. |
| LEFT RESULTANT | 6.51 | 300.36 | 1.85 | 87. | 234. |
| RIGHT HORIZ X AXIS | -1.93 | 19.99 | -89.34 | 50. | 59. |
| RIGHT HORIZ Y AXIS | 6.86 | 521.30 | 0.77 | 50. | 319. |
| RIGHT HORIZ Z AXIS | -2.66 | -1.04 | -288.73 | 0. | 53. |
| RIGHT RESULTANT | 7.63 | 576.81 | 6.89 | 51. | 5. |
| LEFT VERT X AXIS | | | | | |
| LEFT VERT Y AXIS | -0.05 | 1.12 | -51.19 | 21. | 92. |
| LEFT VERT Z AXIS | -0.05 | 207.16 | -1.32 | 95. | 237. |
| LEFT RESULTANT | -0.80 | 2.56 | -588.61 | 281. | 97. |
| RIGHT VERT X AXIS | 1.19 | 625.58 | 0.54 | 97. | 253. |
| RIGHT VERT Y AXIS | -1.74 | 5.41 | -3.61 | 69. | 35. |
| RIGHT VERT Z AXIS | 0.06 | 44.76 | -3.52 | 59. | 310. |
| RIGHT RESULTANT | -1.60 | 0.13 | -57.77 | 1. | 309. |
| RIGHT RESULTANT | 2.79 | 57.90 | 1.31 | 310. | 2. |
| ADAM INTERNAL TEMP (DEG C) | 129.10 | 130.85 | 128.85 | 44. | 1. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | -0.02 | 34.21 | -3.48 | 118. | 209. |
| HEAD Z AXIS | 1.06 | 3.83 | -36.26 | 52. | 89. |
| CHEST Y AXIS | 0.24 | 29.28 | -3.23 | 71. | 289. |
| LUMBAR Y AXIS | -0.08 | 36.70 | -1.47 | 53. | 269. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | -3.03 | 22.47 | -246.55 | 210. | 115. |
| NECK Z AXIS | 0.20 | 491.34 | -43.30 | 111. | 49. |
| LUMBAR Y AXIS | 12.01 | 663.48 | -1639.56 | 99. | 49. |
| ADAM NECK MX TORQUE (IN-LB) | 7.27 | 831.75 | -246.64 | 115. | 77. |

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CHIA STUDY +GY TEST: 3494 SUBJ: ADAM-S WT: 143.0 NOM G: 11.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -322. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 58. | 48. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 1. | 221. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.25 | -1.26 | 85. | 59. |
| Y AXIS | 0.02 | 11.22 | -0.50 | 97. | 235. |
| Z AXIS | 1.00 | 1.55 | -0.12 | 71. | 76. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.22 | 3.01 | -1.71 | 89. | 58. |
| Y AXIS | -0.03 | 18.66 | -1.28 | 82. | 239. |
| Z AXIS | 0.94 | 4.79 | -2.21 | 84. | 93. |
| RESULTANT | 0.97 | 18.97 | 0.67 | 82. | 230. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.08 | 15.75 | -7.38 | 61. | 95. |
| Y AXIS | 0.16 | 35.09 | -1.60 | 62. | 71. |
| Z AXIS | 1.05 | 7.20 | -7.91 | 66. | 124. |
| RESULTANT | 1.06 | 38.51 | 0.44 | 61. | 255. |
| RY (RAD/SEC?) | -7.84 | 2098.47 | -2097.10 | 87. | 94. |
| SLED VELOCITY (PPS) | 0.02 | 51.81 | 0.02 | 231. | 0. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -1.65 | 4.32 | -34.96 | 116. | 86. |
| LEFT Y AXIS | 3.29 | 56.20 | -0.21 | 73. | 269. |
| LEFT Z AXIS | 4.84 | 12.39 | -0.23 | 84. | 78. |
| LEFT RESULTANT | 6.10 | 62.39 | 4.48 | 73. | 242. |
| RIGHT X AXIS | -3.01 | 0.95 | -311.36 | 266. | 123. |
| RIGHT Y AXIS | 0.96 | 72.77 | -2.01 | 122. | 269. |
| RIGHT Z AXIS | 1.06 | 4.19 | -7.23 | 73. | 78. |
| RIGHT RESULTANT | 3.43 | 319.78 | 1.07 | 123. | 278. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -2.30 | 250.11 | -7.42 | 121. | 269. |
| Z AXIS FORCE (LB) | -0.89 | 180.54 | -5.58 | 87. | 266. |
| X AXIS TORQUE (IN-LB) | -4.05 | 478.24 | -5.41 | 124. | 2. |

CHIA STUDY +GY TEST: 3494 SUBJ: ADAM-S WT: 143.0 NOM G: 11.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---------------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -8.25 | -2.91 | -274.68 | 278. | 94. |
| LEFT HORIZ Y AXIS | 11.82 | 232.66 | 8.35 | 69. | 274. |
| LEFT HORIZ Z AXIS | 8.61 | 75.21 | 4.94 | 72. | 268. |
| LEFT RESULTANT | 16.81 | 335.30 | 10.12 | 93. | 280. |
| RIGHT HORIZ X AXIS | -13.53 | 6.59 | -41.83 | 66. | 118. |
| RIGHT HORIZ Y AXIS | -17.92 | 54.58 | -17.52 | 68. | 0. |
| RIGHT HORIZ Z AXIS | 15.67 | 22.14 | -4.78 | 120. | 68. |
| RIGHT RESULTANT | 27.40 | 54.83 | 6.27 | 68. | 25. |
| LEPT VERT X AXIS | | | | | |
| LEPT VERT Y AXIS | -0.11 | 26.84 | -1.14 | 82. | 7. |
| LEPT VERT Z AXIS | -0.05 | 161.45 | -1.27 | 91. | 268. |
| LEPT RESULTANT | -1.63 | 0.41 | -308.38 | 6. | 92. |
| RIGHT VERT X AXIS | 1.75 | 347.54 | 0.41 | 92. | 6. |
| RIGHT VERT Y AXIS | 1.88 | 20.07 | -1.59 | 115. | 32. |
| RIGHT VERT Z AXIS | 0.54 | 45.90 | -0.66 | 71. | 3. |
| RIGHT RESULTANT | -7.87 | -2.06 | -69.60 | 21. | 115. |
| RIGHT RESULTANT | 8.17 | 77.90 | 5.32 | 116. | 269. |
| ADAM INTERNAL TEMP (DEG C) | | | | | |
| ADAM INTERNAL TEMP (DEG C) | 124.29 | 124.35 | 123.60 | 0. | 46. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | -0.08 | 26.35 | -2.54 | 127. | 242. |
| HEAD Z AXIS | 1.06 | 8.23 | -21.40 | 62. | 94. |
| CHEST Y AXIS | 0.11 | 23.17 | -0.40 | 62. | 280. |
| LUMBAR Y AXIS | -0.02 | 28.86 | -0.29 | 76. | 279. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | -2.88 | 16.00 | -170.82 | 237. | 125. |
| NECK Z AXIS | -30.66 | 346.60 | -108.05 | 128. | 62. |
| LUMBAR Y AXIS | -21.71 | 357.20 | -47.36 | 118. | 44. |
| ADAM NECK MX TORQUE (IN-LB) | -4.48 | 544.05 | -208.04 | 127. | 66. |

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CHIA STUDY +GY TEST: 3495 SUBJ: ADAM-S WT: 143.0 NOM G: 11.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -390. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 45. | 1. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 1. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | 0.00 | 0.30 | -1.15 | 70. | 62. |
| Y AXIS | 0.02 | 10.97 | 0.15 | 90. | 0. |
| Z AXIS | 0.98 | 1.54 | 0.01 | 75. | 80. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.24 | 2.41 | -1.40 | 92. | 62. |
| Y AXIS | -0.03 | 17.34 | 0.10 | 83. | 0. |
| Z AXIS | 0.93 | 4.71 | -1.82 | 86. | 94. |
| RESULTANT | 0.96 | 17.44 | 0.94 | 83. | 2. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | -0.06 | 17.93 | -9.09 | 66. | 72. |
| Y AXIS | 0.36 | 34.90 | -1.48 | 65. | 72. |
| Z AXIS | 1.17 | 10.08 | -5.44 | 85. | 115. |
| RESULTANT | 1.23 | 39.37 | 1.16 | 65. | 6. |
| RY (RAD/SEC2) | -5.97 | 2284.64 | -1914.75 | 75. | 63. |
| SLED VELOCITY (FPS) | 0.01 | 49.77 | 0.02 | 210. | 0. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | 1.37 | 7.11 | -24.32 | 117. | 147. |
| LEFT Y AXIS | 3.50 | 48.40 | 3.50 | 72. | 0. |
| LEFT Z AXIS | 4.84 | 10.58 | 2.55 | 86. | 46. |
| LEFT RESULTANT | 6.15 | 49.32 | 5.23 | 76. | 0. |
| RIGHT X AXIS | -3.67 | -3.52 | -296.06 | 1. | 90. |
| RIGHT Y AXIS | 0.49 | 65.79 | 0.35 | 124. | 2. |
| RIGHT Z AXIS | 1.22 | 2.59 | -7.56 | 16. | 81. |
| RIGHT RESULTANT | 3.95 | 302.31 | 3.77 | 90. | 2. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 0.23 | 244.86 | 1.53 | 91. | 0. |
| Z AXIS FORCE (LB) | 1.86 | 193.57 | 1.86 | 87. | 0. |
| X AXIS TORQUE (IN-LB) | 8.20 | 464.52 | 8.20 | 87. | 0. |

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CHIA STUDY +GY TEST: 3495 SUBJ: ADAM-S WT: 143.0 NOM G: 11.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -7.99 | -6.31 | -309.32 | 4. | 92. |
| LEFT HORIZ Y AXIS | 8.84 | 275.02 | 8.97 | 75. | 0. |
| LEFT HORIZ Z AXIS | 8.03 | 99.71 | 7.82 | 75. | 0. |
| LEFT RESULTANT | 14.39 | 412.50 | 13.47 | 82. | 4. |
| RIGHT HORIZ X AXIS | -10.75 | 4.81 | -23.30 | 64. | 107. |
| RIGHT HORIZ Y AXIS | -10.78 | 55.64 | -11.18 | 69. | 0. |
| RIGHT HORIZ Z AXIS | 15.01 | 15.14 | -5.05 | 0. | 70. |
| RIGHT RESULTANT | 21.39 | 55.95 | 7.46 | 70. | 24. |
| LEPT VERT X AXIS | -0.49 | 32.92 | -1.14 | 83. | 10. |
| LEPT VERT Y AXIS | -0.17 | 157.61 | -0.03 | 81. | 0. |
| LEPT VERT Z AXIS | 0.17 | 0.41 | -269.78 | 0. | 93. |
| LEFT RESULTANT | 1.00 | 310.91 | 0.41 | 80. | 0. |
| RIGHT VERT X AXIS | 0.36 | 16.53 | -1.52 | 76. | 31. |
| RIGHT VERT Y AXIS | 0.31 | 41.70 | 0.31 | 69. | 0. |
| RIGHT VERT Z AXIS | -4.30 | -0.84 | -42.65 | 23. | 111. |
| RIGHT RESULTANT | 4.34 | 51.68 | 4.07 | 118. | 0. |
| ADAM INTERNAL TEMP (DEG C) | 120.30 | 120.85 | 120.10 | 22. | 151. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | 0.13 | 24.33 | -0.46 | 130. | 22. |
| HEAD Z AXIS | 1.12 | 7.64 | -19.82 | 63. | 94. |
| CHEST Y AXIS | 0.37 | 24.79 | 0.41 | 62. | 0. |
| LUMBAR Y AXIS | -0.04 | 27.18 | -0.04 | 62. | 0. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | -4.08 | 5.08 | -172.53 | 49. | 129. |
| NECK Z AXIS | -4.91 | 308.72 | -85.60 | 124. | 63. |
| LUMBAR Y AXIS | -9.70 | 351.67 | -43.02 | 119. | 52. |
| ADAM NECK MX TORQUE (IN-LB) | -2.60 | 573.02 | -222.84 | 127. | 67. |

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CHIA STUDY +GY TEST: 3496 SUBJ: ADAM-S WT: 143.0 NOM G: 14.0 CELL: C

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.50 | 341. | 0. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 285. | 0. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.89 | -1.43 | 336. | 59. |
| Y AXIS | 0.01 | 14.50 | -0.50 | 89. | 214. |
| Z AXIS | 0.98 | 1.30 | -0.25 | 211. | 96. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.23 | 2.97 | -2.79 | 85. | 62. |
| Y AXIS | -0.01 | 28.38 | -1.55 | 67. | 220. |
| Z AXIS | 0.94 | 3.86 | -2.06 | 76. | 71. |
| RESULTANT | 0.97 | 28.60 | 0.63 | 67. | 210. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.23 | 23.79 | -14.87 | 60. | 67. |
| Y AXIS | 0.20 | 41.38 | -2.75 | 60. | 283. |
| Z AXIS | 1.02 | 7.59 | -7.02 | 86. | 115. |
| RESULTANT | 1.06 | 47.76 | 0.88 | 60. | 248. |
| RY (RAD/SEC2) | -2.79 | 2808.51 | -2158.92 | 63. | 58. |
| SLED VELOCITY (PPS) | 0.02 | 58.92 | 0.01 | 208. | 1. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -1.26 | 2.59 | -60.26 | 35. | 91. |
| LEFT Y AXIS | 2.46 | 79.46 | -2.28 | 74. | 217. |
| LEFT Z AXIS | 3.35 | 11.42 | -4.63 | 91. | 72. |
| LEFT RESULTANT | 4.38 | 79.70 | 2.33 | 75. | 286. |
| RIGHT X AXIS | -1.26 | 2.77 | -392.55 | 227. | 116. |
| RIGHT Y AXIS | 0.38 | 98.57 | -4.25 | 75. | 220. |
| RIGHT Z AXIS | 1.00 | 3.73 | -11.49 | 58. | 85. |
| RIGHT RESULTANT | 1.75 | 401.86 | 0.90 | 117. | 229. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 0.24 | 328.62 | -7.07 | 116. | 291. |
| Z AXIS FORCE (LB) | 1.06 | 250.42 | -2.70 | 90. | 246. |
| X AXIS TORQUE (IN-LB) | 2.99 | 648.91 | -12.35 | 114. | 333. |

CHIA STUDY +GY TEST: 3496 SUBJ: ADAM-S WT: 143.0 NOM G: 14.0 CELL: C

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|--|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -8.14 | 0.03 | -365.46 | 289. | 88. |
| LEFT HORIZ Y AXIS | 13.22 | 241.21 | -0.49 | 68. | 295. |
| LEFT HORIZ Z AXIS | 9.90 | 96.94 | -0.36 | 89. | 295. |
| LEFT RESULTANT | 18.44 | 436.35 | 0.61 | 88. | 313. |
| RIGHT HORIZ X AXIS | -11.70 | 6.50 | -38.80 | 67. | 328. |
| RIGHT HORIZ Y AXIS | -15.82 | 54.66 | -15.69 | 67. | 0. |
| RIGHT HORIZ Z AXIS | 14.89 | 22.78 | -4.14 | 323. | 62. |
| RIGHT RESULTANT | 24.69 | 55.05 | 5.39 | 67. | 214. |
| LEFT VERT X AXIS | | | | | |
| LEFT VERT Y AXIS | -0.10 | 26.67 | -1.31 | 66. | 317. |
| LEFT VERT Z AXIS | 0.33 | 212.53 | -3.48 | 85. | 291. |
| LEFT RESULTANT | 0.86 | 2.97 | -409.43 | 279. | 88. |
| RIGHT VERT X AXIS | 1.00 | 460.41 | 1.00 | 88. | 0. |
| RIGHT VERT Y AXIS | 1.67 | 16.24 | 0.00 | 67. | 4. |
| RIGHT VERT Z AXIS | 0.66 | 55.18 | -1.72 | 68. | 218. |
| RIGHT RESULTANT | -2.12 | -2.12 | -60.01 | 0. | 110. |
| RIGHT RESULTANT | 2.95 | 70.71 | 2.12 | 110. | 231. |
| ADAM INTERNAL TEMP (DEG C) | | | | | |
| ADAM INTERNAL TEMP (DEG C) | 132.57 | 132.85 | 132.10 | 195. | 19. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | 0.04 | 30.43 | -2.55 | 119. | 208. |
| HEAD Z AXIS | 1.02 | 9.13 | -31.57 | 59. | 88. |
| CHEST Y AXIS | 0.11 | 29.15 | -3.97 | 77. | 276. |
| LUMBAR Y AXIS | -0.04 | 49.20 | -2.72 | 61. | 281. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | -0.98 | 17.39 | -176.01 | 229. | 120. |
| NECK Z AXIS | -4.13 | 435.04 | -98.20 | 118. | 59. |
| LUMBAR Y AXIS | -0.23 | 970.87 | -2265.62 | 71. | 61. |
| ADAM NECK MX TORQUE (IN-LB) | | | | | |
| ADAM NECK MX TORQUE (IN-LB) | 0.31 | 728.37 | -174.93 | 116. | 62. |

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CHIA STUDY +GY TEST: 3497 SUBJ: ADAM-L WT: 216.0 NOM G: 8.0 CELL: D

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -96. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 450. | 7. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 2. | 58. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.51 | -1.37 | 66. | 59. |
| Y AXIS | 0.00 | 7.78 | -0.50 | 61. | 281. |
| Z AXIS | 0.97 | 1.41 | 0.24 | 282. | 57. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.28 | 1.72 | -2.22 | 96. | 58. |
| Y AXIS | -0.06 | 11.56 | -0.82 | 90. | 304. |
| Z AXIS | 0.92 | 2.81 | -1.11 | 96. | 53. |
| RESULTANT | 0.96 | 11.63 | 0.69 | 90. | 330. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.08 | 6.13 | -13.12 | 87. | 105. |
| Y AXIS | 0.09 | 20.89 | -2.29 | 88. | 363. |
| Z AXIS | 1.19 | 5.37 | -6.17 | 91. | 107. |
| RESULTANT | 1.20 | 22.05 | 0.66 | 88. | 386. |
| RY (RAD/SEC2) | -6.03 | 974.38 | -947.63 | 112. | 106. |
| SLED VELOCITY (FPS) | 0.02 | 41.36 | 0.04 | 260. | 0. |
| SHOULDER STRAP FORCES (LB) | | | | | |
| LEFT X AXIS | -6.99 | 4.95 | -28.44 | 49. | 110. |
| LEFT Y AXIS | 8.20 | 39.85 | 5.32 | 90. | 315. |
| LEFT Z AXIS | 8.91 | 14.91 | 3.44 | 58. | 53. |
| LEFT RESULTANT | 14.00 | 44.73 | 9.59 | 110. | 303. |
| RIGHT X AXIS | -5.29 | 4.66 | -370.89 | 303. | 102. |
| RIGHT Y AXIS | 1.70 | 78.59 | -0.86 | 93. | 298. |
| RIGHT Z AXIS | 2.56 | 7.59 | -6.37 | 59. | 100. |
| RIGHT RESULTANT | 6.14 | 378.70 | 0.77 | 102. | 407. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -0.66 | 270.61 | -6.46 | 100. | 313. |
| Z AXIS FORCE (LB) | 5.60 | 173.11 | -3.70 | 99. | 303. |
| X AXIS TORQUE (IN-LB) | -2.68 | 472.77 | -13.61 | 99. | 323. |

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CHIA STUDY +GY TEST: 3497 SUBJ: ADAM-L WT: 216.0 NOM G: 8.0 CELL: D

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -9.81 | 16.68 | -108.27 | 366. | 110. |
| LEFT HORIZ Y AXIS | -10.02 | 50.84 | -29.14 | 116. | 353. |
| LEFT HORIZ Z AXIS | -1.37 | 5.84 | -19.39 | 298. | 108. |
| LEFT RESULTANT | 14.10 | 117.51 | 1.22 | 113. | 248. |
| RIGHT HORIZ X AXIS | -13.68 | 9.87 | -154.13 | 43. | 72. |
| RIGHT HORIZ Y AXIS | 10.42 | 244.44 | -5.27 | 71. | 366. |
| RIGHT HORIZ Z AXIS | -6.66 | -3.30 | -87.42 | 309. | 101. |
| RIGHT RESULTANT | 18.44 | 293.34 | 16.30 | 72. | 300. |
| LEFT VERT X AXIS | | | | | |
| LEFT VERT Y AXIS | -1.71 | 1.19 | -69.37 | 306. | 107. |
| LEFT VERT Z AXIS | -0.13 | 137.17 | -2.67 | 107. | 300. |
| LEFT RESULTANT | -6.34 | 1.79 | -556.88 | 337. | 110. |
| RIGHT VERT X AXIS | 6.59 | 577.70 | 0.28 | 110. | 317. |
| RIGHT VERT Y AXIS | -1.70 | -0.04 | -7.25 | 5. | 59. |
| RIGHT VERT Z AXIS | 0.37 | 29.35 | -3.42 | 69. | 305. |
| RIGHT RESULTANT | -0.77 | 2.57 | -29.59 | 296. | 68. |
| RIGHT RESULTANT | 2.07 | 42.30 | 0.64 | 69. | 268. |
| ADAM INTERNAL TEMP (DEG C) | 107.85 | 108.00 | 107.50 | 0. | 7. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD Y AXIS | -0.12 | 17.27 | -2.58 | 139. | 391. |
| HEAD Z AXIS | 1.10 | 1.95 | -22.43 | 346. | 105. |
| CHEST Y AXIS | -0.15 | 17.41 | -2.00 | 85. | 357. |
| LUMBAR Y AXIS | 0.11 | 18.05 | -1.18 | 76. | 336. |
| ADAM FORCES (LB) | | | | | |
| NECK Y AXIS | 1.48 | 32.95 | -184.23 | 62. | 131. |
| NECK Z AXIS | 14.65 | 256.59 | -8.26 | 106. | 62. |
| LUMBAR Y AXIS | 14.14 | 184.99 | -247.20 | 118. | 72. |
| ADAM NECK MX TORQUE (IN-LB) | 13.59 | 601.24 | -187.50 | 136. | 83. |

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CHIA STUDY -GX TEST: 3498 SUBJ: ADAM-L WT: 216.0 NOM G: 10.0 CELL: G

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -89. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.50 | 413. | 27. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 59. | 29. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.03 | 0.65 | -9.62 | 161. | 55. |
| Y AXIS | 0.00 | 0.62 | -0.35 | 297. | 69. |
| Z AXIS | 1.00 | 1.69 | -0.60 | 52. | 47. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.45 | 2.58 | -11.09 | 168. | 47. |
| Y AXIS | -0.03 | 1.83 | -2.39 | 197. | 185. |
| Z AXIS | 0.85 | 7.32 | -0.12 | 52. | 172. |
| RESULTANT | 0.96 | 11.85 | 0.47 | 47. | 194. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.42 | 9.56 | -15.75 | 232. | 84. |
| Y AXIS | 0.12 | 7.95 | -8.70 | 94. | 88. |
| Z AXIS | 0.92 | 13.69 | -7.57 | 71. | 231. |
| RESULTANT | 1.02 | 19.82 | 0.26 | 85. | 503. |
| RY (RAD/SEC2) | -0.94 | 2474.55 | -2538.74 | 237. | 257. |
| SLED VELOCITY (FPS) | 0.03 | 29.46 | 0.03 | 160. | 1. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -5.38 | 4.18 | -280.06 | 206. | 93. |
| LEFT Y AXIS | 2.01 | 8.43 | -21.50 | 196. | 74. |
| LEFT Z AXIS | 2.16 | 20.51 | -1.28 | 52. | 173. |
| LEFT RESULTANT | 6.21 | 280.95 | 1.84 | 93. | 276. |
| RIGHT X AXIS | -8.03 | 3.89 | -206.67 | 204. | 90. |
| RIGHT Y AXIS | 1.02 | 24.70 | -5.68 | 86. | 210. |
| RIGHT Z AXIS | 0.63 | 14.59 | -3.17 | 51. | 173. |
| RIGHT RESULTANT | 8.13 | 208.09 | 0.66 | 90. | 216. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 2.62 | 15.74 | -19.79 | 69. | 118. |
| Z AXIS FORCE (LB) | 5.90 | 314.39 | -3.59 | 89. | 194. |
| X AXIS TORQUE (IN-LB) | 2.20 | 34.05 | -102.58 | 51. | 98. |

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CHIA STUDY -GX TEST: 3498 SUBJ: ADAM-L WT: 216.0 NOM G: 10.0 CELL: G

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -4.43 | 19.97 | -482.35 | 340. | 96. |
| LEFT HORIZ Y AXIS | -7.34 | 17.13 | -17.83 | 92. | 208. |
| LEFT HORIZ Z AXIS | -3.89 | 32.89 | -17.82 | 53. | 195. |
| LEFT RESULTANT | 9.68 | 482.58 | 3.53 | 96. | 261. |
| RIGHT HORIZ X AXIS | -10.09 | 4.40 | -535.59 | 200. | 93. |
| RIGHT HORIZ Y AXIS | -1.14 | 5.65 | -47.37 | 44. | 85. |
| RIGHT HORIZ Z AXIS | -6.60 | 22.93 | -27.80 | 52. | 97. |
| RIGHT RESULTANT | 12.28 | 537.26 | 2.47 | 95. | 197. |
| LEFT VERT X AXIS | -0.18 | 0.29 | -87.30 | 0. | 95. |
| LEFT VERT Y AXIS | -2.42 | 9.03 | -7.50 | 92. | 66. |
| LEFT VERT Z AXIS | -3.61 | 12.41 | -171.34 | 43. | 97. |
| LEFT RESULTANT | 4.54 | 192.40 | 0.36 | 97. | 447. |
| RIGHT VERT X AXIS | -0.45 | 6.53 | -36.99 | 233. | 92. |
| RIGHT VERT Y AXIS | 0.99 | 6.69 | -3.66 | 178. | 59. |
| RIGHT VERT Z AXIS | -1.44 | 10.68 | -72.94 | 50. | 102. |
| RIGHT RESULTANT | 2.54 | 80.23 | 1.28 | 102. | 8. |
| ADAM INTERNAL TEMP (DEG C) | 91.98 | 92.08 | 91.33 | 110. | 12. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.42 | 7.69 | -16.09 | 261. | 105. |
| HEAD Z AXIS | 0.84 | 5.71 | -5.57 | 65. | 94. |
| CHEST X AXIS | 0.00 | 11.19 | -13.32 | 225. | 91. |
| LUMBAR X AXIS | 0.53 | 7.23 | -13.36 | 224. | 76. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -16.37 | 148.11 | -87.80 | 111. | 261. |
| NECK Z AXIS | -4.59 | 72.79 | -63.07 | 243. | 50. |
| LUMBAR X AXIS | 15.96 | 153.00 | -104.96 | 232. | 100. |
| ADAM NECK MY TORQUE (IN-LB) | 12.32 | 175.87 | -152.13 | 110. | 251. |

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CHIA STUDY -GX TEST: 3499 SUBJ: ADAM-L WT: 216.0 NOM G: 20.0 CELL: H

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -109. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 40. | 0. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 270. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.03 | 0.62 | -19.72 | 180. | 78. |
| Y AXIS | -0.02 | 1.41 | -0.86 | 275. | 259. |
| Z AXIS | 0.96 | 2.98 | -0.59 | 259. | 35. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.54 | 3.99 | -19.16 | 258. | 77. |
| Y AXIS | -0.08 | 2.40 | -1.72 | 72. | 261. |
| Z AXIS | 0.80 | 11.79 | -1.31 | 41. | 273. |
| RESULTANT | 0.97 | 22.27 | 0.36 | 77. | 271. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.49 | 10.80 | -34.23 | 255. | 68. |
| Y AXIS | 0.08 | 18.96 | -10.74 | 275. | 68. |
| Z AXIS | 1.01 | 32.41 | -9.26 | 76. | 253. |
| RESULTANT | 1.12 | 45.67 | 0.25 | 68. | 234. |
| RY (RAD/SEC2) | -9.80 | 4231.03 | -4236.53 | 266. | 281. |
| SLED VELOCITY (PPS) | -0.01 | 73.80 | 0.01 | 183. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -5.21 | 10.58 | -640.82 | 259. | 74. |
| LEFT Y AXIS | 6.70 | 13.61 | -41.63 | 340. | 64. |
| LEFT Z AXIS | 6.12 | 36.47 | -1.38 | 41. | 274. |
| LEFT RESULTANT | 10.56 | 642.92 | 5.00 | 74. | 336. |
| RIGHT X AXIS | -8.67 | 11.04 | -545.17 | 258. | 70. |
| RIGHT Y AXIS | 2.04 | 58.31 | -4.79 | 69. | 263. |
| RIGHT Z AXIS | 2.03 | 26.13 | -5.58 | 41. | 274. |
| RIGHT RESULTANT | 9.15 | 548.45 | 1.02 | 70. | 301. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -0.68 | 44.40 | -37.30 | 68. | 109. |
| Z AXIS FORCE (LB) | 5.48 | 772.97 | -16.39 | 71. | 273. |
| X AXIS TORQUE (IN-LB) | 0.00 | 103.83 | -153.02 | 52. | 80. |

CHIA STUDY -GX TEST: 3499 SUBJ: ADAM-L WT: 216.0 NOM G: 20.0 CELL: H

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -7.30 | 42.45 | -1621.46 | 256. | 83. |
| LEFT HORIZ Y AXIS | -7.73 | 171.19 | -17.55 | 89. | 262. |
| LEFT HORIZ Z AXIS | -14.83 | 47.30 | -32.38 | 41. | 486. |
| LEFT RESULTANT | 18.37 | 1630.11 | 12.20 | 83. | 312. |
| RIGHT HORIZ X AXIS | -12.02 | 51.49 | -1706.60 | 258. | 85. |
| RIGHT HORIZ Y AXIS | 8.92 | 14.49 | -144.57 | 28. | 89. |
| RIGHT HORIZ Z AXIS | -10.00 | 27.46 | -33.41 | 28. | 75. |
| RIGHT RESULTANT | 18.13 | 1712.63 | 6.85 | 87. | 311. |
| LEFT VERT X AXIS | -1.54 | 2.58 | -252.89 | 307. | 80. |
| LEFT VERT Y AXIS | -1.01 | 101.62 | -7.70 | 81. | 271. |
| LEFT VERT Z AXIS | -16.67 | 17.72 | -370.20 | 29. | 80. |
| LEFT RESULTANT | 16.82 | 459.70 | 1.40 | 81. | 460. |
| RIGHT VERT X AXIS | -1.52 | 5.88 | -128.32 | 258. | 81. |
| RIGHT VERT Y AXIS | 1.06 | 7.69 | -26.80 | 244. | 86. |
| RIGHT VERT Z AXIS | -9.45 | 13.19 | -189.43 | 26. | 110. |
| RIGHT RESULTANT | 9.67 | 226.88 | 1.62 | 83. | 430. |
| ADAM INTERNAL TEMP (DEG C) | -258.44 | -257.68 | -258.92 | 269. | 96. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.20 | 8.34 | -51.91 | 255. | 88. |
| HEAD Z AXIS | 0.94 | 181.31 | -89.34 | 86. | 126. |
| CHEST X AXIS | 0.89 | 86.43 | -69.11 | 53. | 59. |
| LUMBAR X AXIS | 0.47 | 8.17 | -29.82 | 251. | 58. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -4.92 | 506.37 | -88.18 | 88. | 285. |
| NECK Z AXIS | -20.96 | 245.53 | -82.45 | 75. | 53. |
| LUMBAR X AXIS | -5.61 | 196.86 | -1213.87 | 254. | 90. |
| ADAM NECK MY TORQUE (IN-LB) | -7.81 | 601.32 | -234.28 | 83. | 273. |

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CHIA STUDY -GX TEST: 3500 SUBJ: ADAM-S WT: 143.0 NOM G: 10.0 CELL: G

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.50 | 22. | 7. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 22. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.48 | -9.64 | 159. | 55. |
| Y AXIS | 0.00 | 0.44 | -0.32 | 58. | 324. |
| Z AXIS | 0.98 | 2.02 | -0.29 | 257. | 47. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.55 | 3.22 | -10.62 | 165. | 48. |
| Y AXIS | -0.04 | 2.16 | -2.40 | 196. | 182. |
| Z AXIS | 0.82 | 7.07 | -0.40 | 53. | 169. |
| RESULTANT | 0.99 | 11.69 | 0.42 | 64. | 192. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.56 | 8.24 | -10.86 | 223. | 76. |
| Y AXIS | 0.23 | 2.85 | -3.22 | 108. | 116. |
| Z AXIS | 0.90 | 13.18 | -3.59 | 68. | 231. |
| RESULTANT | 1.09 | 15.93 | 0.42 | 70. | 174. |
| RY (RAD/SEC2) | -11.64 | 1378.65 | -2060.34 | 237. | 252. |
| SLED VELOCITY (FPS) | 0.00 | 29.73 | 0.00 | 160. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -5.57 | 11.13 | -170.47 | 224. | 79. |
| LEFT Y AXIS | 2.62 | 11.60 | -10.27 | 174. | 75. |
| LEFT Z AXIS | 2.42 | 19.84 | -1.95 | 53. | 170. |
| LEFT RESULTANT | 6.75 | 171.39 | 0.79 | 81. | 359. |
| RIGHT X AXIS | -5.98 | 5.32 | -181.41 | 182. | 79. |
| RIGHT Y AXIS | 0.63 | 14.16 | -4.53 | 70. | 207. |
| RIGHT Z AXIS | 0.64 | 15.91 | -4.39 | 53. | 169. |
| RIGHT RESULTANT | 6.10 | 181.98 | 1.48 | 79. | 201. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -1.80 | 49.98 | -10.41 | 242. | 187. |
| Z AXIS FORCE (LB) | 4.39 | 250.87 | -14.74 | 80. | 248. |
| X AXIS TORQUE (IN-LB) | 0.16 | 155.81 | -40.93 | 242. | 102. |

CHIA STUDY -GX TEST: 3500 SUBJ: ADAM-S WT: 143.0 NOM G: 10.0 CELL: G

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -1.69 | 6.28 | -364.17 | 203. | 81. |
| LEFT HORIZ Y AXIS | -2.28 | 63.05 | -13.84 | 82. | 212. |
| LEFT HORIZ Z AXIS | -0.34 | 32.67 | -7.17 | 52. | 170. |
| LEFT RESULTANT | 3.52 | 370.23 | 0.16 | 82. | 2. |
| RIGHT HORIZ X AXIS | -6.77 | 6.03 | -383.27 | 482. | 86. |
| RIGHT HORIZ Y AXIS | -1.38 | 4.74 | -69.49 | 178. | 85. |
| RIGHT HORIZ Z AXIS | -0.25 | 33.95 | -6.63 | 53. | 170. |
| RIGHT RESULTANT | 7.18 | 389.58 | 1.24 | 86. | 204. |
| LEFT VERT X AXIS | -1.60 | 0.92 | -50.17 | 353. | 83. |
| LEFT VERT Y AXIS | -0.98 | 24.15 | -6.36 | 87. | 186. |
| LEFT VERT Z AXIS | -8.40 | 8.25 | -85.67 | 42. | 86. |
| LEFT RESULTANT | 8.64 | 101.00 | 0.93 | 87. | 386. |
| RIGHT VERT X AXIS | -2.11 | 1.38 | -49.40 | 208. | 80. |
| RIGHT VERT Y AXIS | 0.10 | 5.21 | -12.04 | 175. | 90. |
| RIGHT VERT Z AXIS | -1.87 | 6.18 | -71.01 | 24. | 90. |
| RIGHT RESULTANT | 3.21 | 87.34 | 1.40 | 90. | 396. |
| ADAM INTERNAL TEMP (DEG C) | 81.78 | 81.56 | 80.81 | 0. | 172. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.53 | 36.99 | -18.14 | 241. | 104. |
| HEAD Z AXIS | 0.86 | 4.45 | -6.02 | 53. | 82. |
| CHEST X AXIS | 0.14 | 6.62 | -12.67 | 217. | 70. |
| LUMBAR X AXIS | 0.60 | 4.25 | -13.72 | 218. | 79. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -5.98 | 149.97 | -59.68 | 103. | 224. |
| NECK Z AXIS | -1.92 | 204.90 | -39.26 | 243. | 50. |
| LUMBAR X AXIS | 7.64 | 123.28 | -51.25 | 227. | 94. |
| ADAM NECK MY TORQUE (IN-LB) | -5.39 | 119.98 | -112.84 | 95. | 242. |

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CHIA STUDY -GX TEST: 3501 SUBJ: ADAM-S WT: 143.0 NOM G: 10.0 CELL: G

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -85. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 0. | 494. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 142. | 449. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.05 | 0.46 | -9.61 | 183. | 56. |
| Y AXIS | -0.04 | 0.48 | -0.35 | 57. | 192. |
| Z AXIS | 0.78 | 1.54 | -0.37 | 164. | 47. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.73 | 3.48 | -10.36 | 164. | 47. |
| Y AXIS | -0.08 | 2.29 | -2.50 | 194. | 181. |
| Z AXIS | 0.79 | 6.91 | -0.39 | 52. | 168. |
| RESULTANT | 1.08 | 11.37 | 0.26 | 64. | 191. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.75 | 7.68 | -11.57 | 224. | 77. |
| Y AXIS | 0.17 | 2.30 | -3.69 | 257. | 76. |
| Z AXIS | 0.68 | 12.17 | -5.10 | 68. | 238. |
| RESULTANT | 1.03 | 16.16 | 0.22 | 70. | 198. |
| RY (RAD/SEC2) | -0.02 | 2154.49 | -1636.04 | 234. | 219. |
| SLED VELOCITY (FPS) | 0.02 | 29.63 | -0.05 | 158. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | 3.73 | 15.87 | -177.57 | 204. | 79. |
| LEFT Y AXIS | -1.97 | 6.88 | -14.99 | 173. | 75. |
| LEFT Z AXIS | -3.26 | 15.05 | -5.60 | 53. | 168. |
| LEFT RESULTANT | 5.57 | 178.33 | 1.19 | 79. | 10. |
| RIGHT X AXIS | -4.60 | 5.64 | -185.06 | 202. | 78. |
| RIGHT Y AXIS | 0.64 | 13.04 | -4.49 | 70. | 179. |
| RIGHT Z AXIS | -0.86 | 15.15 | -3.88 | 53. | 168. |
| RIGHT RESULTANT | 4.84 | 185.58 | 1.68 | 78. | 182. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -4.81 | 14.24 | -14.17 | 230. | 185. |
| Z AXIS FORCE (LB) | 4.13 | 251.47 | -10.40 | 73. | 237. |
| X AXIS TORQUE (IN-LB) | 2.27 | 38.64 | -18.74 | 230. | 107. |

CHIA STUDY -GX TEST: 3501 SUBJ: ADAM-S WT: 143.0 NOM G: 10.0 CELL: G

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -8.23 | 5.78 | -408.63 | 203. | 81. |
| LEFT HORIZ Y AXIS | -3.95 | 72.14 | -15.24 | 83. | 231. |
| LEFT HORIZ Z AXIS | 0.13 | 34.26 | -5.58 | 52. | 169. |
| LEFT RESULTANT | 9.46 | 415.26 | 2.15 | 83. | 226. |
| RIGHT HORIZ X AXIS | -6.64 | 6.40 | -401.73 | 233. | 82. |
| RIGHT HORIZ Y AXIS | 0.37 | 9.61 | -68.15 | 194. | 85. |
| RIGHT HORIZ Z AXIS | -0.72 | 33.75 | -6.83 | 53. | 203. |
| RIGHT RESULTANT | 7.05 | 407.52 | 1.00 | 85. | 208. |
| LEFT VERT X AXIS | -0.89 | 1.17 | -54.79 | 352. | 80. |
| LEFT VERT Y AXIS | -4.06 | 26.70 | -7.63 | 86. | 185. |
| LEFT VERT Z AXIS | -4.59 | 9.23 | -101.02 | 36. | 84. |
| LEFT RESULTANT | 6.40 | 117.98 | 2.99 | 86. | 437. |
| RIGHT VERT X AXIS | 0.29 | 3.92 | -43.23 | 371. | 81. |
| RIGHT VERT Y AXIS | -1.22 | 5.41 | -8.38 | 173. | 90. |
| RIGHT VERT Z AXIS | -0.50 | 9.52 | -61.24 | 37. | 87. |
| RIGHT RESULTANT | 1.59 | 75.12 | 0.40 | 87. | 3. |
| ADAM INTERNAL TEMP (DEG C) | 97.86 | 98.10 | 97.35 | 44. | 168. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.94 | 58.58 | -17.98 | 229. | 104. |
| HEAD Z AXIS | 0.86 | 5.41 | -8.82 | 52. | 231. |
| CHEST X AXIS | 0.66 | 6.93 | -13.18 | 222. | 71. |
| LUMBAR X AXIS | 0.63 | 3.94 | -14.43 | 230. | 77. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -4.78 | 159.37 | -55.16 | 104. | 223. |
| NECK Z AXIS | -8.23 | 231.51 | -57.56 | 231. | 51. |
| LUMBAR X AXIS | 47.14 | 150.58 | -31.89 | 229. | 147. |
| ADAM NECK MY TORQUE (IN-LB) | -14.11 | 151.26 | -100.97 | 96. | 231. |

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CHIA STUDY -GX TEST: 3502 SUBJ: ADAM-S VT: 143.0 NOM G: 10.0 CELL: L

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 84. | 26. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 3. | 85. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.50 | -9.67 | 160. | 56. |
| Y AXIS | 0.00 | 0.51 | -0.19 | 57. | 172. |
| Z AXIS | 0.96 | 1.91 | -0.31 | 209. | 47. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.50 | 3.24 | -10.86 | 164. | 47. |
| Y AXIS | -0.04 | 2.10 | -2.73 | 194. | 182. |
| Z AXIS | 0.84 | 7.12 | -0.43 | 52. | 168. |
| RESULTANT | 0.98 | 11.91 | 0.14 | 63. | 191. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.58 | 5.15 | -10.99 | 211. | 73. |
| Y AXIS | 0.18 | 2.88 | -1.73 | 106. | 217. |
| Z AXIS | 0.89 | 16.14 | -4.78 | 73. | 226. |
| RESULTANT | 1.08 | 19.55 | 0.12 | 73. | 238. |
| RY (RAD/SEC2) | -9.40 | 917.07 | -1879.98 | 225. | 74. |
| SLED VELOCITY (FPS) | 0.03 | 30.02 | 0.04 | 157. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -4.66 | 5.21 | -172.44 | 183. | 76. |
| LEFT Y AXIS | 2.76 | 10.77 | -11.10 | 173. | 74. |
| LEFT Z AXIS | 2.67 | 19.52 | -1.12 | 52. | 169. |
| LEFT RESULTANT | 6.17 | 173.59 | 1.87 | 76. | 225. |
| RIGHT X AXIS | -2.59 | 6.12 | -184.58 | 180. | 78. |
| RIGHT Y AXIS | 0.89 | 15.00 | -3.69 | 70. | 161. |
| RIGHT Z AXIS | 0.74 | 16.59 | -3.70 | 53. | 169. |
| RIGHT RESULTANT | 2.97 | 181.16 | 1.84 | 78. | 245. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -2.52 | 12.65 | -10.44 | 173. | 160. |
| Z AXIS FORCE (LB) | 3.30 | 250.50 | -3.89 | 72. | 193. |
| X AXIS TORQUE (IN-LB) | -4.38 | 33.66 | -26.45 | 79. | 97. |

CHIA STUDY -GX TEST: 3502 SUBJ: ADAM-S WT: 143.0 NOM G: 10.0 CELL: L

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -11.24 | -0.38 | -320.60 | 198. | 74. |
| LEFT HORIZ Y AXIS | 15.01 | 170.00 | 2.24 | 69. | 200. |
| LEFT HORIZ Z AXIS | 12.05 | 184.78 | 3.69 | 69. | 188. |
| LEFT RESULTANT | 22.49 | 407.22 | 4.33 | 74. | 200. |
| RIGHT HORIZ X AXIS | -12.71 | 5.40 | -308.55 | 370. | 77. |
| RIGHT HORIZ Y AXIS | -15.98 | -1.84 | -167.97 | 194. | 70. |
| RIGHT HORIZ Z AXIS | 14.55 | 229.54 | -0.41 | 68. | 391. |
| RIGHT RESULTANT | 25.16 | 418.24 | 2.08 | 77. | 391. |
| LEFT VERT X AXIS | 1.78 | 11.14 | -15.62 | 157. | 45. |
| LEFT VERT Y AXIS | -0.48 | 13.50 | -6.84 | 94. | 186. |
| LEFT VERT Z AXIS | -8.00 | 12.41 | -65.17 | 52. | 89. |
| LEFT RESULTANT | 8.28 | 66.56 | 1.14 | 94. | 10. |
| RIGHT VERT X AXIS | -0.29 | 14.07 | -18.57 | 162. | 45. |
| RIGHT VERT Y AXIS | -0.60 | 5.17 | -15.52 | 198. | 89. |
| RIGHT VERT Z AXIS | -4.17 | 5.73 | -68.25 | 25. | 87. |
| RIGHT RESULTANT | 4.44 | 70.32 | 3.27 | 90. | 366. |
| ADAM INTERNAL TEMP (DEG C) | 84.23 | 84.74 | 82.99 | 84. | 365. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.60 | 10.54 | -18.22 | 256. | 103. |
| HEAD Z AXIS | 0.83 | 4.50 | -7.95 | 49. | 84. |
| CHEST X AXIS | -0.16 | 5.78 | -15.27 | 215. | 68. |
| LUMBAR X AXIS | 0.61 | 5.36 | -13.01 | 210. | 72. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | 1.29 | 165.19 | -46.09 | 104. | 247. |
| NECK Z AXIS | -7.42 | 47.09 | -53.94 | 253. | 49. |
| LUMBAR X AXIS | 11.85 | 145.50 | -60.77 | 219. | 93. |
| ADAM NECK MY TORQUE (IN-LB) | -6.84 | 140.47 | -65.19 | 95. | 240. |

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CHIA STUDY -GX TEST: 3503 SUBJ: ADAM-L WT: 216.0 NOM G: 10.0 CELL: L

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.54 | 2.31 | 165. | 163. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 9.98 | 165. | 163. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.68 | -9.64 | 161. | 54. |
| Y AXIS | -0.02 | 0.54 | -0.35 | 301. | 68. |
| Z AXIS | 0.96 | 2.02 | -0.36 | 264. | 46. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.51 | 3.10 | -10.83 | 168. | 46. |
| Y AXIS | -0.07 | 2.33 | -3.00 | 199. | 186. |
| Z AXIS | 0.81 | 7.15 | -0.40 | 51. | 172. |
| RESULTANT | 0.96 | 11.84 | 0.38 | 63. | 194. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.50 | 13.09 | -11.29 | 224. | 94. |
| Y AXIS | 0.10 | 9.75 | -10.20 | 96. | 91. |
| Z AXIS | 0.87 | 12.64 | -5.96 | 84. | 221. |
| RESULTANT | 1.00 | 16.55 | 0.14 | 96. | 322. |
| RY (RAD/SEC2) | -0.59 | 1925.83 | -2613.64 | 229. | 222. |
| SLED VELOCITY (PPS) | 0.02 | 29.39 | 0.03 | 162. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -8.29 | 3.71 | -252.90 | 187. | 93. |
| LEFT Y AXIS | 5.02 | 12.06 | -17.87 | 177. | 74. |
| LEFT Z AXIS | 4.95 | 22.50 | 1.86 | 51. | 71. |
| LEFT RESULTANT | 10.90 | 253.62 | 4.20 | 93. | 185. |
| RIGHT X AXIS | -8.97 | 7.23 | -215.26 | 206. | 79. |
| RIGHT Y AXIS | 1.82 | 24.56 | -5.82 | 87. | 209. |
| RIGHT Z AXIS | 1.54 | 16.52 | -1.24 | 52. | 155. |
| RIGHT RESULTANT | 9.31 | 215.93 | 0.72 | 79. | 248. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 0.21 | 12.58 | -24.72 | 44. | 102. |
| Z AXIS FORCE (LB) | 10.07 | 306.61 | -3.89 | 83. | 194. |
| X AXIS TORQUE (IN-LB) | 1.22 | 31.81 | -80.23 | 117. | 94. |

CHIA STUDY -GX TEST: 3503 SUBJ: ADAM-L WT: 216.0 NOM G: 10.0 CELL: L

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -8.28 | 4.52 | -491.51 | 221. | 85. |
| LEFT HORIZ Y AXIS | 8.46 | 239.14 | -2.03 | 83. | 213. |
| LEFT HORIZ Z AXIS | 11.66 | 268.66 | 0.65 | 82. | 217. |
| LEFT RESULTANT | 16.65 | 607.69 | 2.38 | 85. | 217. |
| RIGHT HORIZ X AXIS | -13.52 | 0.00 | -464.64 | 198. | 86. |
| RIGHT HORIZ Y AXIS | -7.63 | -0.28 | -201.76 | 218. | 87. |
| RIGHT HORIZ Z AXIS | 14.93 | 325.51 | 4.26 | 84. | 200. |
| RIGHT RESULTANT | 21.65 | 602.12 | 4.27 | 87. | 218. |
| LEFT VERT X AXIS | 3.26 | 17.86 | -16.20 | 161. | 46. |
| LEFT VERT Y AXIS | -0.64 | 7.47 | -6.51 | 166. | 74. |
| LEFT VERT Z AXIS | -2.53 | 9.88 | -67.70 | 32. | 156. |
| LEFT RESULTANT | 4.25 | 69.11 | 2.38 | 156. | 7. |
| RIGHT VERT X AXIS | 2.26 | 20.67 | -19.22 | 167. | 45. |
| RIGHT VERT Y AXIS | 0.25 | 4.90 | -7.17 | 177. | 107. |
| RIGHT VERT Z AXIS | -9.08 | 6.63 | -86.64 | 51. | 117. |
| RIGHT RESULTANT | 9.45 | 87.85 | 3.22 | 117. | 9. |
| ADAM INTERNAL TEMP (DEG C) | 75.55 | 75.73 | 74.98 | 1. | 393. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.35 | 7.22 | -15.35 | 253. | 102. |
| HEAD Z AXIS | 0.93 | 5.13 | -3.54 | 62. | 96. |
| CHEST X AXIS | 0.62 | 10.55 | -12.22 | 217. | 80. |
| LUMBAR X AXIS | 0.42 | 6.51 | -13.08 | 218. | 78. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -4.64 | 148.01 | -75.14 | 102. | 254. |
| NECK Z AXIS | -5.73 | 295.64 | -59.78 | 166. | 64. |
| LUMBAR X AXIS | 17.28 | 171.06 | -175.57 | 226. | 104. |
| ADAM NECK MY TORQUE (IN-LB) | 12.18 | 246.46 | -175.24 | 95. | 243. |

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CHIA STUDY -GX TEST: 3504 SUBJ: ADAM-L WT: 216.0 NOM G: 20.0 CELL: M

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -112. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.49 | 29. | 455. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 1. | 326. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.69 | -20.20 | 179. | 83. |
| Y AXIS | 0.03 | 1.28 | -0.75 | 272. | 49. |
| Z AXIS | 1.00 | 1.78 | -0.22 | 252. | 63. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 2.18 | -19.91 | 270. | 62. |
| Y AXIS | -0.04 | 2.84 | -2.70 | 287. | 53. |
| Z AXIS | 0.83 | 12.88 | -0.19 | 57. | 268. |
| RESULTANT | 0.96 | 23.14 | 0.39 | 71. | 284. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.51 | 13.96 | -48.77 | 245. | 62. |
| Y AXIS | 0.15 | 17.50 | -11.90 | 263. | 64. |
| Z AXIS | 0.90 | 29.30 | -7.89 | 58. | 251. |
| RESULTANT | 1.05 | 54.83 | 0.16 | 62. | 469. |
| RY (RAD/SEC2) | -13.05 | 5667.45 | -6697.63 | 250. | 63. |
| SLED VELOCITY (PPS) | 0.01 | 73.89 | -0.02 | 183. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -11.84 | 4.10 | -615.71 | 269. | 69. |
| LEFT Y AXIS | 2.28 | 10.43 | -37.92 | 286. | 60. |
| LEFT Z AXIS | 3.33 | 35.62 | 0.07 | 68. | 267. |
| LEFT RESULTANT | 12.52 | 617.58 | 3.35 | 69. | 470. |
| RIGHT X AXIS | -3.55 | 5.16 | -535.16 | 258. | 70. |
| RIGHT Y AXIS | 1.12 | 51.41 | -7.01 | 66. | 272. |
| RIGHT Z AXIS | 0.43 | 24.43 | -3.48 | 37. | 272. |
| RIGHT RESULTANT | 3.78 | 537.53 | 1.52 | 70. | 216. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -4.70 | 31.51 | -14.67 | 114. | 179. |
| Z AXIS FORCE (LB) | 7.55 | 766.98 | -11.15 | 68. | 243. |
| X AXIS TORQUE (IN-LB) | -11.83 | 98.21 | -87.60 | 108. | 66. |

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CHIA STUDY -GX TEST: 3504 SUBJ: ADAM-L WT: 216.0 NOM G: 20.0 CELL: M

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -10.16 | 5.78 | -1607.90 | 268. | 74. |
| LEFT HORIZ Y AXIS | 5.15 | 715.87 | -7.62 | 72. | 272. |
| LEFT HORIZ Z AXIS | 7.86 | 883.34 | -3.98 | 73. | 261. |
| LEFT RESULTANT | 14.11 | 1966.40 | 0.88 | 74. | 230. |
| RIGHT HORIZ X AXIS | -14.48 | -6.03 | -1500.40 | 259. | 74. |
| RIGHT HORIZ Y AXIS | -3.74 | 3.46 | -636.31 | 287. | 71. |
| RIGHT HORIZ Z AXIS | 6.75 | 1015.76 | -5.48 | 72. | 270. |
| RIGHT RESULTANT | 16.52 | 1917.43 | 6.16 | 74. | 263. |
| LEFT VERT X AXIS | 1.27 | 11.09 | -40.00 | 173. | 74. |
| LEFT VERT Y AXIS | -2.62 | 7.65 | -7.60 | 97. | 53. |
| LEFT VERT Z AXIS | -3.61 | 16.33 | -81.67 | 35. | 153. |
| LEFT RESULTANT | 4.79 | 82.03 | 1.64 | 159. | 301. |
| RIGHT VERT X AXIS | 2.12 | 19.00 | -31.77 | 168. | 36. |
| RIGHT VERT Y AXIS | 0.17 | 5.21 | -27.56 | 289. | 83. |
| RIGHT VERT Z AXIS | -6.12 | 16.27 | -128.46 | 34. | 94. |
| RIGHT RESULTANT | 6.71 | 131.41 | 2.76 | 94. | 302. |
| ADAM INTERNAL TEMP (DEG C) | 81.55 | 83.58 | 81.33 | 133. | 3. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.34 | 8.53 | -45.05 | 274. | 88. |
| HEAD Z AXIS | 1.00 | 6.28 | -29.80 | 51. | 70. |
| CHEST X AXIS | 0.14 | 19.04 | -35.86 | 240. | 69. |
| LUMBAR X AXIS | 0.48 | 8.70 | -27.39 | 241. | 75. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -30.22 | 429.76 | -81.90 | 87. | 273. |
| NECK Z AXIS | -43.52 | 210.45 | -79.10 | 70. | 41. |
| LUMBAR X AXIS | 59.77 | 264.09 | -872.55 | 243. | 85. |
| ADAM NECK MY TORQUE (IN-LB) | 70.50 | 519.09 | -234.51 | 82. | 262. |

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CHIA STUDY -GX TEST: 3505 SUBJ: ADAM-L WT: 216.0 NOM G: 20.0 CELL: M

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -99. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.49 | 56. | 402. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 9. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.04 | 0.70 | -20.04 | 179. | 79. |
| Y AXIS | -0.02 | 1.38 | -0.95 | 269. | 49. |
| Z AXIS | 0.98 | 2.03 | -0.27 | 254. | 63. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.51 | 2.97 | -19.12 | 270. | 74. |
| Y AXIS | -0.03 | 2.50 | -2.73 | 69. | 53. |
| Z AXIS | 0.82 | 12.85 | -0.32 | 57. | 271. |
| RESULTANT | 0.97 | 22.66 | 0.57 | 78. | 298. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.56 | 20.59 | -32.98 | 244. | 64. |
| Y AXIS | 0.16 | 9.29 | -12.58 | 264. | 68. |
| Z AXIS | 0.91 | 38.71 | -7.28 | 72. | 241. |
| RESULTANT | 1.08 | 45.65 | 0.17 | 72. | 492. |
| RY (RAD/SEC2) | 0.30 | 3410.98 | -5532.65 | 84. | 68. |
| SLED VELOCITY (PPS) | 0.02 | 73.30 | 0.01 | 183. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -6.13 | 6.47 | -562.02 | 256. | 70. |
| LEFT Y AXIS | 3.70 | 8.66 | -37.39 | 265. | 80. |
| LEFT Z AXIS | 4.25 | 35.92 | 0.37 | 70. | 272. |
| LEFT RESULTANT | 8.42 | 563.99 | 2.72 | 71. | 447. |
| RIGHT X AXIS | -7.43 | 11.36 | -584.59 | 271. | 70. |
| RIGHT Y AXIS | 1.79 | 61.60 | -2.66 | 67. | 270. |
| RIGHT Z AXIS | 0.93 | 24.16 | -3.76 | 36. | 271. |
| RIGHT RESULTANT | 7.75 | 587.90 | 0.65 | 70. | 208. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 0.10 | 35.42 | -12.54 | 67. | 180. |
| Z AXIS FORCE (LB) | 5.57 | 767.58 | -10.55 | 68. | 245. |
| X AXIS TORQUE (IN-LB) | -0.21 | 147.56 | -13.66 | 107. | 90. |

CHIA STUDY -GX TEST: 3505 SUBJ: ADAM-L WT: 216.0 NOM G: 20.0 CELL: M

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| Harness Anchor Forces (LB) | | | | | |
| LEFT HORIZ X AXIS | -12.89 | 4.02 | -1415.01 | 254. | 80. |
| LEFT HORIZ Y AXIS | 7.19 | 650.16 | -3.43 | 76. | 238. |
| LEFT HORIZ Z AXIS | 10.85 | 792.87 | -3.91 | 77. | 271. |
| LEFT RESULTANT | 18.53 | 1740.73 | 2.28 | 78. | 243. |
| RIGHT HORIZ X AXIS | -12.43 | 0.13 | -1437.74 | 267. | 80. |
| RIGHT HORIZ Y AXIS | -5.39 | 2.90 | -626.27 | 248. | 74. |
| RIGHT HORIZ Z AXIS | 12.34 | 1010.83 | -3.65 | 74. | 270. |
| RIGHT RESULTANT | 18.51 | 1853.62 | 0.70 | 78. | 274. |
| LEFT VERT X AXIS | 2.29 | 12.02 | -31.78 | 254. | 63. |
| LEFT VERT Y AXIS | -0.04 | 17.95 | -6.20 | 92. | 54. |
| LEFT VERT Z AXIS | -11.93 | 12.41 | -73.34 | 24. | 90. |
| LEFT RESULTANT | 12.16 | 80.48 | 3.93 | 91. | 309. |
| RIGHT VERT X AXIS | 0.20 | 18.06 | -29.09 | 171. | 37. |
| RIGHT VERT Y AXIS | -0.59 | 2.65 | -21.49 | 60. | 86. |
| RIGHT VERT Z AXIS | -2.95 | 16.60 | -95.97 | 36. | 91. |
| RIGHT RESULTANT | 3.20 | 97.93 | 1.07 | 91. | 320. |
| ADAM INTERNAL TEMP (DEG C) | 84.38 | 84.79 | 83.79 | 190. | 11. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.24 | 7.19 | -49.23 | 277. | 90. |
| HEAD Z AXIS | 0.88 | 5.91 | -27.74 | 64. | 96. |
| CHEST X AXIS | 72.94 | 80.31 | -36.25 | 160. | 68. |
| LUMBAR X AXIS | 0.39 | 8.98 | -36.21 | 242. | 62. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -3.01 | 479.72 | -76.57 | 90. | 277. |
| NECK Z AXIS | -19.26 | 210.07 | -84.97 | 101. | 64. |
| LUMBAR X AXIS | 23.22 | 256.99 | -790.98 | 245. | 91. |
| ADAM NECK MY TORQUE (IN-LB) | 15.32 | 495.90 | -171.80 | 85. | 266. |

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CHIA STUDY -GX TEST: 3506 SUBJ: ADAM-S VT: 143.0 NOM G: 20.0 CELL: M

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -102. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 427. | 10. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 2. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.06 | 0.65 | -20.44 | 192. | 80. |
| Y AXIS | -0.03 | 1.30 | -0.52 | 276. | 58. |
| Z AXIS | 0.92 | 1.95 | -1.14 | 35. | 28. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.42 | 1.66 | -19.98 | 199. | 60. |
| Y AXIS | -0.07 | 1.96 | -2.56 | 39. | 61. |
| Z AXIS | 0.78 | 13.10 | -0.04 | 80. | 463. |
| RESULTANT | 0.89 | 23.58 | 0.34 | 59. | 255. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.75 | 5.41 | -25.95 | 245. | 61. |
| Y AXIS | 0.12 | 2.02 | -5.12 | 229. | 83. |
| Z AXIS | 0.69 | 29.05 | -5.49 | 56. | 254. |
| RESULTANT | 1.03 | 36.32 | 0.44 | 60. | 309. |
| RY (RAD/SEC2) | -24.95 | 2041.38 | -2039.55 | 257. | 270. |
| SLED VELOCITY (FPS) | 0.06 | 73.84 | 0.06 | 184. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | 1.12 | 11.29 | -383.50 | 427. | 89. |
| LEFT Y AXIS | 7.08 | 13.81 | -18.42 | 213. | 57. |
| LEFT Z AXIS | 7.36 | 39.39 | 4.98 | 69. | 188. |
| LEFT RESULTANT | 10.51 | 385.84 | 6.80 | 91. | 246. |
| RIGHT X AXIS | -2.68 | 3.89 | -417.24 | 202. | 60. |
| RIGHT Y AXIS | 1.11 | 29.33 | -3.39 | 97. | 224. |
| RIGHT Z AXIS | 1.21 | 30.24 | -2.74 | 34. | 256. |
| RIGHT RESULTANT | 3.47 | 418.32 | 0.25 | 60. | 220. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -5.61 | 53.00 | -12.72 | 59. | 198. |
| Z AXIS FORCE (LB) | -0.67 | 553.00 | -8.16 | 90. | 248. |
| X AXIS TORQUE (IN-LB) | -4.52 | 166.79 | -5.36 | 55. | 0. |

CHIA STUDY -GX TEST: 3506 SUBJ: ADAM-S WT: 143.0 NOM G: 20.0 CELL: M

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -10.17 | -3.89 | -995.96 | 4. | 63. |
| LEFT HORIZ Y AXIS | 6.47 | 489.74 | -10.06 | 64. | 244. |
| LEFT HORIZ Z AXIS | 4.90 | 525.88 | -6.52 | 64. | 242. |
| LEFT RESULTANT | 13.21 | 1228.14 | 3.98 | 64. | 270. |
| RIGHT HORIZ X AXIS | -10.46 | -2.01 | -881.05 | 217. | 65. |
| RIGHT HORIZ Y AXIS | -8.39 | 2.90 | -364.71 | 231. | 65. |
| RIGHT HORIZ Z AXIS | 6.69 | 591.71 | -3.45 | 65. | 218. |
| RIGHT RESULTANT | 15.18 | 1122.22 | 2.11 | 65. | 217. |
| LEFT VERT X AXIS | 0.10 | 7.40 | -33.96 | 241. | 60. |
| LEFT VERT Y AXIS | -1.14 | 14.11 | -7.50 | 68. | 34. |
| LEFT VERT Z AXIS | -5.97 | 20.25 | -41.00 | 34. | 69. |
| LEFT RESULTANT | 6.10 | 53.61 | 0.23 | 69. | 364. |
| RIGHT VERT X AXIS | -6.12 | 4.06 | -35.84 | 171. | 29. |
| RIGHT VERT Y AXIS | -1.11 | 4.86 | -34.80 | 312. | 73. |
| RIGHT VERT Z AXIS | -6.19 | 16.08 | -106.14 | 35. | 75. |
| RIGHT RESULTANT | 8.89 | 112.08 | 4.54 | 76. | 344. |
| ADAM INTERNAL TEMP (DEG C) | 93.89 | 94.00 | 93.25 | 1. | 15. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.71 | 5.07 | -43.72 | 248. | 83. |
| HEAD Z AXIS | 0.86 | 7.15 | -20.51 | 39. | 70. |
| CHEST X AXIS | -1.53 | 5.57 | -30.72 | 241. | 53. |
| LUMBAR X AXIS | 1.08 | 8.04 | -35.71 | 237. | 58. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -4.49 | 400.00 | -43.69 | 82. | 248. |
| NECK Z AXIS | -14.93 | 164.10 | -71.65 | 94. | 40. |
| LUMBAR X AXIS | 7.48 | 206.43 | -269.57 | 245. | 80. |
| ADAM NECK MY TORQUE (IN-LB) | -13.44 | 346.99 | -192.39 | 74. | 55. |

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CHIA STUDY -GX TEST: 3507 SUBJ: ADAM-S WT: 143.0 NOM G: 20.0 CELL: M

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -101. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 3. | 38. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 62. | 4. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.69 | -20.10 | 179. | 75. |
| Y AXIS | -0.03 | 1.00 | -0.27 | 278. | 358. |
| Z AXIS | 0.90 | 1.71 | -0.52 | 30. | 37. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.68 | 1.29 | -18.75 | 266. | 65. |
| Y AXIS | -0.07 | 1.52 | -1.05 | 37. | 66. |
| Z AXIS | 0.78 | 12.17 | 0.05 | 79. | 279. |
| RESULTANT | 1.04 | 22.16 | 0.84 | 65. | 208. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.54 | 3.48 | -28.35 | 234. | 62. |
| Y AXIS | 0.16 | 5.77 | -11.19 | 72. | 85. |
| Z AXIS | 0.88 | 31.03 | -3.17 | 52. | 247. |
| RESULTANT | 1.05 | 35.76 | 0.43 | 62. | 308. |
| RY (RAD/SEC2) | -13.76 | 1040.87 | -2336.98 | 261. | 63. |
| SLED VELOCITY (PPS) | 0.03 | 73.13 | 0.03 | 184. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | 6.55 | 10.50 | -396.13 | 212. | 92. |
| LEFT Y AXIS | 4.02 | 6.77 | -19.71 | 295. | 90. |
| LEFT Z AXIS | 1.84 | 32.46 | 0.34 | 91. | 240. |
| LEFT RESULTANT | 7.94 | 397.85 | 2.95 | 92. | 189. |
| RIGHT X AXIS | -3.06 | 3.97 | -413.19 | 267. | 61. |
| RIGHT Y AXIS | 1.38 | 22.46 | -2.08 | 95. | 283. |
| RIGHT Z AXIS | 0.73 | 24.69 | -1.95 | 33. | 278. |
| RIGHT RESULTANT | 3.68 | 414.03 | 0.64 | 61. | 217. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -4.72 | 55.81 | -11.69 | 60. | 283. |
| Z AXIS FORCE (LB) | 0.15 | 546.19 | -7.48 | 88. | 279. |
| X AXIS TORQUE (IN-LB) | -0.13 | 179.58 | -80.01 | 50. | 94. |

CHIA STUDY -GX TEST: 3507 SUBJ: ADAM-S WT: 143.0 NOM G: 20.0 CELL: M

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -8.14 | -1.38 | -962.05 | 210. | 63. |
| LEFT HORIZ Y AXIS | 9.48 | 451.06 | -3.29 | 64. | 226. |
| LEFT HORIZ Z AXIS | 7.98 | 509.87 | -0.80 | 62. | 219. |
| LEFT RESULTANT | 15.03 | 1178.55 | 1.61 | 64. | 219. |
| RIGHT HORIZ X AXIS | -7.37 | -0.12 | -778.71 | 213. | 64. |
| RIGHT HORIZ Y AXIS | -7.36 | -0.57 | -346.96 | 216. | 63. |
| RIGHT HORIZ Z AXIS | 6.14 | 529.90 | -1.01 | 64. | 219. |
| RIGHT RESULTANT | 12.28 | 1003.77 | 1.17 | 64. | 219. |
| LEFT VERT X AXIS | | | | | |
| LEFT VERT Y AXIS | 2.72 | 9.93 | -33.87 | 241. | 63. |
| LEFT VERT Z AXIS | -1.46 | 17.90 | -7.53 | 70. | 46. |
| LEFT RESULTANT | -9.81 | 20.50 | -53.00 | 32. | 69. |
| RIGHT VERT X AXIS | 10.33 | 63.83 | 1.19 | 69. | 339. |
| RIGHT VERT Y AXIS | -0.55 | 7.40 | -32.50 | 171. | 47. |
| RIGHT VERT Z AXIS | -0.69 | 5.35 | -53.28 | 35. | 78. |
| RIGHT RESULTANT | -4.05 | 15.37 | -151.87 | 30. | 78. |
| RIGHT RESULTANT | 4.46 | 161.10 | 0.74 | 78. | 317. |
| ADAM INTERNAL TEMP (DEG C) | 93.28 | 93.53 | 92.78 | 2. | 369. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.51 | 4.69 | -46.08 | 253. | 85. |
| HEAD Z AXIS | 0.94 | 7.39 | -25.60 | 41. | 71. |
| CHEST X AXIS | -0.28 | 4.34 | -30.19 | 241. | 55. |
| LUMBAR X AXIS | 0.41 | 6.03 | -36.55 | 235. | 58. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -1.38 | 416.05 | -39.01 | 84. | 252. |
| NECK Z AXIS | -9.77 | 188.04 | -82.79 | 94. | 42. |
| LUMBAR X AXIS | 7.31 | 182.14 | -214.52 | 51. | 80. |
| ADAM NECK MY TORQUE (IN-LB) | 2.16 | 403.49 | -194.10 | 79. | 57. |

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CHIA STUDY -GX TEST: 3511 SUBJ: ADAM-S WT: 143.0 NOM G: 30.0 CELL: N

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -169. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 412. | 205. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 3. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.90 | -31.01 | 147. | 68. |
| Y AXIS | -0.01 | 2.29 | -1.44 | 244. | 282. |
| Z AXIS | 1.04 | 3.76 | -2.32 | 31. | 37. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.49 | 1.64 | -28.78 | 150. | 68. |
| Y AXIS | -0.04 | 3.38 | -1.92 | 73. | 252. |
| Z AXIS | 0.83 | 17.78 | -0.19 | 54. | 190. |
| RESULTANT | 0.96 | 33.61 | 0.46 | 68. | 418. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.67 | 4.98 | -43.47 | 208. | 50. |
| Y AXIS | 0.16 | 6.05 | -12.76 | 71. | 75. |
| Z AXIS | 0.86 | 59.58 | -7.50 | 47. | 210. |
| RESULTANT | 1.10 | 67.87 | 0.24 | 47. | 265. |
| RY (RAD/SEC2) | -8.23 | 4378.99 | -4806.94 | 66. | 49. |
| SLED VELOCITY (FPS) | 0.04 | 94.21 | 0.05 | 154. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -2.25 | 4.74 | -686.14 | 187. | 77. |
| LEFT Y AXIS | 4.95 | 10.27 | -31.17 | 182. | 58. |
| LEFT Z AXIS | 4.29 | 54.09 | 1.33 | 73. | 242. |
| LEFT RESULTANT | 7.14 | 688.74 | 1.87 | 78. | 245. |
| RIGHT X AXIS | -2.00 | 7.78 | -608.03 | 189. | 79. |
| RIGHT Y AXIS | 1.07 | 37.84 | -4.23 | 78. | 246. |
| RIGHT Z AXIS | 2.05 | 43.03 | -2.64 | 32. | 221. |
| RIGHT RESULTANT | 3.47 | 610.02 | 0.48 | 79. | 225. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -0.19 | 65.26 | -11.12 | 52. | 438. |
| Z AXIS FORCE (LB) | 2.34 | 900.61 | -8.45 | 77. | 232. |
| X AXIS TORQUE (IN-LB) | 1.97 | 64.92 | -129.08 | 55. | 71. |

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CHIA STUDY -GX TEST: 3511 SUBJ: ADAM-S WT: 143.0 NOM G: 30.0 CELL: N

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -7.45 | -2.14 | -1119.78 | 0. | 55. |
| LEFT HORIZ Y AXIS | 7.89 | 584.31 | -2.87 | 53. | 194. |
| LEFT HORIZ Z AXIS | 5.72 | 606.93 | -1.52 | 53. | 194. |
| LEFT RESULTANT | 12.51 | 1398.30 | 2.70 | 55. | 361. |
| RIGHT HORIZ X AXIS | -8.01 | 5.27 | -1187.71 | 185. | 55. |
| RIGHT HORIZ Y AXIS | -7.34 | 14.14 | -530.20 | 186. | 79. |
| RIGHT HORIZ Z AXIS | 10.08 | 814.90 | -3.45 | 54. | 406. |
| RIGHT RESULTANT | 14.95 | 1521.88 | 1.01 | 55. | 337. |
| LEFT VERT X AXIS | 0.38 | 7.49 | -55.77 | 145. | 52. |
| LEFT VERT Y AXIS | 0.31 | 43.10 | -9.03 | 74. | 349. |
| LEFT VERT Z AXIS | -7.69 | 32.67 | -106.17 | 31. | 73. |
| LEFT RESULTANT | 7.78 | 123.97 | 0.23 | 73. | 307. |
| RIGHT VERT X AXIS | -3.07 | 14.51 | -43.53 | 148. | 33. |
| RIGHT VERT Y AXIS | -0.60 | 6.83 | -36.28 | 34. | 69. |
| RIGHT VERT Z AXIS | -4.37 | 21.48 | -81.43 | 30. | 71. |
| RIGHT RESULTANT | 5.57 | 94.29 | 1.03 | 71. | 395. |
| ADAM INTERNAL TEMP (DEG C) | 82.43 | 83.12 | 81.63 | 412. | 53. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.79 | 6.26 | -61.57 | 216. | 72. |
| HEAD Z AXIS | 0.76 | 14.32 | -46.72 | 45. | 74. |
| CHEST X AXIS | -0.45 | 5.37 | -50.42 | 203. | 46. |
| LUMBAR X AXIS | 0.67 | 109.24 | -54.82 | 31. | 46. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -1.13 | 560.70 | -55.26 | 72. | 242. |
| NECK Z AXIS | 2.13 | 405.57 | -88.38 | 76. | 46. |
| LUMBAR X AXIS | 19.86 | 266.40 | -566.60 | 45. | 71. |
| ADAM NECK MY TORQUE (IN-LB) | -10.60 | 692.50 | -331.93 | 65. | 50. |

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CHIA STUDY -GX TEST: 3512 SUBJ: ADAM-L WT: 216.0 NOM G: 30.0 CELL: N

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.50 | 326. | 0. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 111. | 342. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.04 | 1.00 | -30.40 | 148. | 72. |
| Y AXIS | -0.01 | 2.51 | -0.98 | 245. | 46. |
| Z AXIS | 0.98 | 3.97 | -2.62 | 30. | 36. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.50 | 2.26 | -30.29 | 216. | 64. |
| Y AXIS | -0.04 | 4.03 | -2.82 | 69. | 221. |
| Z AXIS | 0.84 | 18.14 | -0.63 | 65. | 246. |
| RESULTANT | 0.98 | 35.27 | 0.21 | 64. | 422. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.53 | 16.53 | -49.77 | 211. | 59. |
| Y AXIS | 0.15 | 55.48 | -25.73 | 61. | 66. |
| Z AXIS | 0.94 | 50.63 | -12.47 | 59. | 216. |
| RESULTANT | 1.09 | 83.57 | 0.41 | 60. | 317. |
| RY (RAD/SEC2) | -1.08 | 7384.81 | -11078.75 | 67. | 61. |
| SLED VELOCITY (FPS) | 0.02 | 93.08 | 0.04 | 160. | 1. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -8.36 | 7.58 | -963.59 | 217. | 76. |
| LEFT Y AXIS | 2.14 | 16.00 | -73.79 | 233. | 58. |
| LEFT Z AXIS | 2.67 | 55.70 | -1.65 | 76. | 228. |
| LEFT RESULTANT | 9.05 | 967.78 | 0.72 | 78. | 214. |
| RIGHT X AXIS | -8.28 | 11.28 | -731.66 | 217. | 60. |
| RIGHT Y AXIS | 1.17 | 60.90 | -9.21 | 65. | 220. |
| RIGHT Z AXIS | 0.46 | 40.42 | -3.98 | 31. | 148. |
| RIGHT RESULTANT | 8.41 | 734.39 | 0.68 | 62. | 176. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 0.94 | 43.90 | -46.68 | 47. | 84. |
| Z AXIS FORCE (LB) | 7.18 | 1110.63 | -15.41 | 60. | 214. |
| X AXIS TORQUE (IN-LB) | -0.23 | 89.08 | -421.90 | 38. | 65. |

CHIA STUDY -GX TEST: 3512 SUBJ: ADAM-L WT: 216.0 NOM G: 30.0 CELL: N

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -12.17 | -5.65 | -2435.58 | 216. | 67. |
| LEFT HORIZ Y AXIS | 10.07 | 1016.80 | -7.27 | 66. | 219. |
| LEFT HORIZ Z AXIS | 11.96 | 1285.28 | -0.43 | 66. | 195. |
| LEFT RESULTANT | 19.91 | 2934.42 | 5.68 | 67. | 378. |
| RIGHT HORIZ X AXIS | -13.68 | -0.88 | -2342.91 | 393. | 72. |
| RIGHT HORIZ Y AXIS | -3.73 | 3.75 | -886.99 | 235. | 62. |
| RIGHT HORIZ Z AXIS | 11.76 | 1565.48 | -0.20 | 63. | 244. |
| RIGHT RESULTANT | 18.51 | 2908.46 | 3.31 | 71. | 398. |
| LEFT VERT X AXIS | 2.29 | 17.08 | -53.48 | 217. | 61. |
| LEFT VERT Y AXIS | -0.13 | 22.76 | -14.11 | 135. | 255. |
| LEFT VERT Z AXIS | -7.93 | 32.59 | -81.75 | 29. | 136. |
| LEFT RESULTANT | 8.28 | 84.66 | 2.39 | 136. | 5. |
| RIGHT VERT X AXIS | 3.35 | 21.76 | -50.78 | 214. | 64. |
| RIGHT VERT Y AXIS | 0.35 | 8.24 | -22.80 | 33. | 72. |
| RIGHT VERT Z AXIS | -5.87 | 29.01 | -80.34 | 55. | 144. |
| RIGHT RESULTANT | 6.93 | 86.19 | 3.18 | 76. | 3. |
| ADAM INTERNAL TEMP (DEG C) | 75.26 | 204.96 | 37.53 | 94. | 98. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.13 | 9.76 | -72.66 | 217. | 78. |
| HEAD Z AXIS | 0.88 | 13.97 | -58.38 | 50. | 64. |
| CHEST X AXIS | -0.20 | 21.17 | -43.09 | 209. | 50. |
| LUMBAR X AXIS | 0.34 | 12.41 | -61.46 | 211. | 49. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -4.75 | 691.87 | -132.20 | 77. | 243. |
| NECK Z AXIS | -7.72 | 377.62 | -139.73 | 87. | 51. |
| LUMBAR X AXIS | 8.47 | 329.06 | -1476.67 | 213. | 76. |
| ADAM NECK MY TORQUE (IN-LB) | 0.85 | 824.43 | -280.59 | 72. | 233. |

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CHIA STUDY -GX TEST: 3513 SUBJ: ADAM-S WT: 143.0 NOM G: 40.0 CELL: 0

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -182. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.46 | 27. | 31. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 0. | 30. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.81 | -42.11 | 350. | 63. |
| Y AXIS | -0.02 | 2.09 | -1.18 | 319. | 350. |
| Z AXIS | 0.97 | 4.65 | -2.77 | 25. | 31. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.54 | 2.60 | -38.57 | 130. | 68. |
| Y AXIS | -0.05 | 3.44 | -2.00 | 69. | 368. |
| Z AXIS | 0.83 | 24.86 | -0.69 | 58. | 131. |
| RESULTANT | 0.99 | 44.83 | 0.68 | 68. | 166. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.66 | 25.17 | -50.13 | 186. | 74. |
| Y AXIS | 0.17 | 7.27 | -12.53 | 199. | 52. |
| Z AXIS | 0.88 | 60.65 | -13.24 | 42. | 189. |
| RESULTANT | 1.12 | 71.62 | 0.36 | 43. | 268. |
| RY (RAD/SEC2) | -1.04 | 5674.18 | -7332.85 | 186. | 75. |
| SLED VELOCITY (FPS) | 0.03 | 108.57 | -0.02 | 140. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | 1.53 | 10.18 | -862.29 | 358. | 69. |
| LEFT Y AXIS | 2.79 | 7.53 | -54.64 | 195. | 61. |
| LEFT Z AXIS | 2.23 | 67.60 | -1.22 | 60. | 130. |
| LEFT RESULTANT | 4.19 | 866.32 | 1.74 | 70. | 163. |
| RIGHT X AXIS | -1.24 | 11.44 | -795.07 | 358. | 70. |
| RIGHT Y AXIS | 0.66 | 54.05 | -4.37 | 74. | 203. |
| RIGHT Z AXIS | 0.94 | 47.83 | -4.19 | 26. | 130. |
| RIGHT RESULTANT | 2.18 | 797.91 | 0.68 | 72. | 178. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 1.28 | 88.45 | -9.24 | 42. | 158. |
| Z AXIS FORCE (LB) | 1.14 | 1167.05 | -7.63 | 69. | 163. |
| X AXIS TORQUE (IN-LB) | 3.15 | 132.31 | -157.34 | 37. | 64. |

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CHIA STUDY -GX TEST: 3513 SUBJ: ADAM-S WT: 143.0 NOM G: 40.0 CELL: 0

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -8.17 | 4.14 | -1741.39 | 324. | 68. |
| LEFT HORIZ Y AXIS | 7.75 | 723.98 | -6.50 | 48. | 207. |
| LEFT HORIZ Z AXIS | 7.39 | 916.45 | -3.48 | 70. | 180. |
| LEFT RESULTANT | 13.56 | 2091.21 | 2.20 | 68. | 172. |
| RIGHT HORIZ X AXIS | -10.98 | 6.41 | -1695.17 | 356. | 50. |
| RIGHT HORIZ Y AXIS | -11.83 | 3.53 | -731.68 | 360. | 71. |
| RIGHT HORIZ Z AXIS | 12.28 | 1152.79 | -3.72 | 48. | 376. |
| RIGHT RESULTANT | 20.47 | 2164.38 | 0.36 | 50. | 334. |
| LEFT VERT X AXIS | 2.24 | 11.97 | -78.05 | 186. | 67. |
| LEFT VERT Y AXIS | -0.63 | 56.09 | -8.75 | 63. | 396. |
| LEFT VERT Z AXIS | -4.82 | 36.01 | -119.15 | 25. | 63. |
| LEFT RESULTANT | 5.39 | 151.86 | 1.35 | 63. | 412. |
| RIGHT VERT X AXIS | 0.47 | 23.07 | -71.23 | 185. | 58. |
| RIGHT VERT Y AXIS | -0.56 | 6.93 | -77.56 | 29. | 64. |
| RIGHT VERT Z AXIS | -4.18 | 32.80 | -192.33 | 25. | 63. |
| RIGHT RESULTANT | 4.64 | 214.38 | 1.46 | 63. | 418. |
| ADAM INTERNAL TEMP (DEG C) | 63.28 | 63.66 | 62.66 | 42. | 374. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.65 | 9.01 | -92.34 | 217. | 66. |
| HEAD Z AXIS | 0.78 | 25.07 | -72.12 | 40. | 55. |
| CHEST X AXIS | -1.03 | 12.59 | -62.80 | 179. | 41. |
| LUMBAR X AXIS | 0.78 | 15.21 | -73.89 | 180. | 40. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -3.80 | 862.43 | -78.56 | 65. | 218. |
| NECK Z AXIS | -17.51 | 604.13 | -191.52 | 67. | 40. |
| LUMBAR X AXIS | -2.10 | 274.65 | -1129.55 | 184. | 63. |
| ADAM NECK MY TORQUE (IN-LB) | -3.89 | 830.26 | -446.41 | 60. | 45. |

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CHIA STUDY -GX TEST: 3514 SUBJ: ADAM-S WT: 143.0 NOM G: 45.0 CELL: P

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -237. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.49 | 278. | 199. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 178. | 86. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.75 | -43.82 | 354. | 62. |
| Y AXIS | -0.01 | 2.13 | -0.73 | 188. | 47. |
| Z AXIS | 0.95 | 5.01 | -3.10 | 26. | 32. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.50 | 2.81 | -41.90 | 127. | 66. |
| Y AXIS | -0.08 | 4.23 | -1.47 | 68. | 61. |
| Z AXIS | 0.82 | 25.69 | -0.69 | 57. | 129. |
| RESULTANT | 0.96 | 48.43 | 0.33 | 67. | 353. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.50 | 18.05 | -65.95 | 188. | 44. |
| Y AXIS | 0.11 | 2.84 | -14.89 | 64. | 68. |
| Z AXIS | 0.87 | 66.29 | -12.08 | 43. | 190. |
| RESULTANT | 1.01 | 90.90 | 0.28 | 43. | 212. |
| RY (RAD/SEC2) | -17.58 | 8484.07 | -10560.30 | 61. | 65. |
| SLED VELOCITY (FPS) | 0.01 | 111.93 | -0.01 | 132. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -0.57 | 7.03 | -861.51 | 147. | 69. |
| LEFT Y AXIS | 5.78 | 9.32 | -34.42 | 340. | 54. |
| LEFT Z AXIS | 5.69 | 82.58 | 2.29 | 69. | 130. |
| LEFT RESULTANT | 8.35 | 865.73 | 2.76 | 69. | 354. |
| RIGHT X AXIS | -2.90 | 4.13 | -889.79 | 145. | 70. |
| RIGHT Y AXIS | 1.19 | 53.77 | -3.48 | 72. | 165. |
| RIGHT Z AXIS | 1.34 | 53.31 | -3.78 | 27. | 214. |
| RIGHT RESULTANT | 3.67 | 892.72 | 0.16 | 70. | 193. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -1.67 | 81.81 | -10.55 | 46. | 138. |
| Z AXIS FORCE (LB) | 0.23 | 1156.50 | -10.70 | 69. | 242. |
| X AXIS TORQUE (IN-LB) | 1.17 | 275.05 | -6.39 | 53. | 199. |

CHIA STUDY -GX TEST: 3514 SUBJ: ADAM-S WT: 143.0 NOM G: 45.0 CELL: P

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| Harness Anchor Forces (LB) | | | | | |
| LEFT HORIZ X AXIS | -7.15 | 5.65 | -1965.92 | 349. | 63. |
| LEFT HORIZ Y AXIS | 6.41 | 842.95 | -6.36 | 47. | 171. |
| LEFT HORIZ Z AXIS | 6.27 | 1070.37 | -5.29 | 47. | 339. |
| LEFT RESULTANT | 11.76 | 2339.82 | 1.89 | 63. | 333. |
| RIGHT HORIZ X AXIS | -7.28 | -1.00 | -1790.49 | 160. | 63. |
| RIGHT HORIZ Y AXIS | -10.11 | 0.49 | -706.44 | 178. | 68. |
| RIGHT HORIZ Z AXIS | 7.55 | 1170.17 | -3.25 | 67. | 172. |
| RIGHT RESULTANT | 14.61 | 2241.19 | 1.13 | 64. | 335. |
| LEFT VERT X AXIS | 1.36 | 15.86 | -83.89 | 183. | 63. |
| LEFT VERT Y AXIS | -1.05 | 47.06 | -10.14 | 64. | 360. |
| LEFT VERT Z AXIS | -5.75 | 34.30 | -112.70 | 25. | 182. |
| LEFT RESULTANT | 6.14 | 132.86 | 2.99 | 63. | 4. |
| RIGHT VERT X AXIS | -2.94 | 17.84 | -61.95 | 184. | 66. |
| RIGHT VERT Y AXIS | -0.11 | 4.86 | -84.80 | 28. | 63. |
| RIGHT VERT Z AXIS | -2.43 | 34.80 | -212.85 | 26. | 62. |
| RIGHT RESULTANT | 4.35 | 235.56 | 0.72 | 63. | 1. |
| ADAM INTERNAL TEMP (DEG C) | 74.55 | 76.86 | 73.12 | 38. | 42. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.68 | 14.38 | -104.43 | 233. | 66. |
| HEAD Z AXIS | 0.77 | 21.45 | -84.24 | 40. | 56. |
| CHEST X AXIS | -0.31 | 12.64 | -70.62 | 178. | 41. |
| LUMBAR X AXIS | 0.67 | 16.01 | -78.22 | 179. | 40. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -1.07 | 985.49 | -72.52 | 66. | 216. |
| NECK Z AXIS | -32.17 | 801.26 | -81.39 | 69. | 32. |
| LUMBAR X AXIS | -0.15 | 301.62 | -1197.78 | 183. | 69. |
| ADAM NECK MY TORQUE (IN-LB) | -7.39 | 927.50 | -613.03 | 61. | 47. |

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CHIA STUDY -GX TEST: 3515 SUBJ: ADAM-S WT: 143.0 NOM G: 20.0 CELL: H

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -162. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.50 | 70. | 357. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 70. | 71. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.55 | -20.09 | 179. | 74. |
| Y AXIS | -0.04 | 1.32 | -0.59 | 250. | 164. |
| Z AXIS | 0.97 | 1.94 | -0.54 | 30. | 37. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.51 | 1.15 | -18.46 | 309. | 78. |
| Y AXIS | -0.04 | 1.28 | -0.88 | 37. | 221. |
| Z AXIS | 0.82 | 12.75 | 0.33 | 57. | 179. |
| RESULTANT | 0.97 | 21.75 | 0.73 | 79. | 180. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.54 | 17.96 | -32.81 | 242. | 58. |
| Y AXIS | 0.23 | 9.36 | -10.59 | 72. | 67. |
| Z AXIS | 0.88 | 17.98 | -4.11 | 55. | 248. |
| RESULTANT | 1.06 | 37.01 | 0.07 | 57. | 337. |
| RY (RAD/SEC2) | -3.24 | 2001.96 | -2705.64 | 51. | 46. |
| SLED VELOCITY (FPS) | 0.02 | 76.00 | -0.01 | 182. | 1. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -4.47 | 2.37 | -388.47 | 252. | 65. |
| LEFT Y AXIS | 2.09 | 6.61 | -24.47 | 232. | 66. |
| LEFT Z AXIS | 1.13 | 34.57 | -2.13 | 64. | 403. |
| LEFT RESULTANT | 5.21 | 390.70 | 1.62 | 65. | 236. |
| RIGHT X AXIS | -1.43 | 4.53 | -396.74 | 270. | 91. |
| RIGHT Y AXIS | 0.40 | 17.97 | -5.40 | 101. | 219. |
| RIGHT Z AXIS | 0.70 | 25.78 | -2.13 | 33. | 181. |
| RIGHT RESULTANT | 2.33 | 397.61 | 0.82 | 91. | 0. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -0.71 | 52.50 | -7.89 | 102. | 218. |
| Z AXIS FORCE (LB) | 1.53 | 548.43 | -5.24 | 89. | 225. |
| X AXIS TORQUE (IN-LB) | -2.46 | 86.35 | -63.94 | 105. | 70. |

CHIA STUDY -GX TEST: 3515 SUBJ: ADAM-S WT: 143.0 NOM G: 20.0 CELL: H

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -1.48 | 11.80 | -867.24 | 233. | 66. |
| LEFT HORIZ Y AXIS | -1.21 | 141.55 | -8.74 | 69. | 220. |
| LEFT HORIZ Z AXIS | 1.70 | 60.48 | -4.71 | 63. | 213. |
| LEFT RESULTANT | 3.89 | 879.56 | 2.19 | 67. | 212. |
| RIGHT HORIZ X AXIS | -4.82 | 25.37 | -979.26 | 249. | 64. |
| RIGHT HORIZ Y AXIS | -0.36 | 6.43 | -202.11 | 231. | 59. |
| RIGHT HORIZ Z AXIS | 1.48 | 87.58 | -7.10 | 113. | 433. |
| RIGHT RESULTANT | 5.73 | 1000.55 | 0.76 | 65. | 205. |
| LEFT VERT X AXIS | -0.47 | 3.55 | -159.46 | 355. | 68. |
| LEFT VERT Y AXIS | -0.05 | 77.55 | -3.81 | 95. | 269. |
| LEFT VERT Z AXIS | -10.20 | 12.41 | -236.67 | 23. | 93. |
| LEFT RESULTANT | 10.28 | 289.01 | 1.13 | 94. | 368. |
| RIGHT VERT X AXIS | -0.36 | 3.26 | -130.93 | 252. | 63. |
| RIGHT VERT Y AXIS | -0.86 | 3.52 | -39.59 | 34. | 63. |
| RIGHT VERT Z AXIS | -7.54 | 11.39 | -159.07 | 23. | 64. |
| RIGHT RESULTANT | 7.64 | 209.48 | 1.52 | 64. | 378. |
| ADAM INTERNAL TEMP (DEG C) | 66.82 | 67.92 | 66.42 | 70. | 74. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.74 | 6.49 | -42.50 | 250. | 84. |
| HEAD Z AXIS | 0.60 | 4.03 | -27.77 | 33. | 70. |
| CHEST X AXIS | -0.08 | 7.80 | -30.36 | 243. | 54. |
| LUMBAR X AXIS | 0.92 | 6.02 | -37.44 | 242. | 56. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -6.37 | 372.24 | -63.32 | 85. | 248. |
| NECK Z AXIS | -12.11 | 151.69 | -105.10 | 98. | 76. |
| LUMBAR X AXIS | -4.13 | 138.67 | -559.46 | 249. | 88. |
| ADAM NECK NY TORQUE (IN-LB) | -8.07 | 139.38 | -202.09 | 89. | 57. |

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CHIA STUDY -GX TEST: 3516 SUBJ: ADAM-S WF: 133.0 NOM G: 20.0 CELL: H

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -164. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 234. | 387. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 2. | 160. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.04 | 0.62 | -20.36 | 178. | 79. |
| Y AXIS | -0.02 | 0.81 | -0.27 | 280. | 236. |
| Z AXIS | 0.96 | 1.91 | -0.40 | 40. | 46. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.50 | 1.29 | -18.76 | 267. | 76. |
| Y AXIS | -0.07 | 1.26 | -1.01 | 100. | 290. |
| Z AXIS | 0.83 | 12.46 | 0.22 | 74. | 179. |
| RESULTANT | 0.98 | 22.43 | 0.66 | 76. | 222. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.56 | 22.79 | -32.95 | 240. | 50. |
| Y AXIS | 0.15 | 6.29 | -7.52 | 94. | 85. |
| Z AXIS | 0.82 | 22.21 | -4.19 | 57. | 254. |
| RESULTANT | 1.00 | 35.97 | 0.19 | 58. | 296. |
| RY (RAD/SEC2) | -7.34 | 2522.23 | -3316.42 | 54. | 49. |
| SLED VELOCITY (PPS) | 0.02 | 77.11 | 0.05 | 185. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -3.49 | 7.89 | -442.16 | 381. | 89. |
| LEFT Y AXIS | 2.71 | 6.47 | -28.07 | 275. | 61. |
| LEFT Z AXIS | 3.20 | 37.78 | 1.08 | 83. | 180. |
| LEFT RESULTANT | 5.61 | 444.66 | 2.15 | 89. | 260. |
| RIGHT X AXIS | -2.62 | 7.47 | -369.97 | 227. | 61. |
| RIGHT Y AXIS | 0.51 | 23.30 | -2.41 | 100. | 264. |
| RIGHT Z AXIS | 0.55 | 27.00 | -2.18 | 40. | 343. |
| RIGHT RESULTANT | 3.00 | 371.28 | 0.60 | 62. | 247. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -1.74 | 49.77 | -7.07 | 123. | 263. |
| Z AXIS FORCE (LB) | 0.94 | 538.78 | -7.41 | 61. | 286. |
| X AXIS TORQUE (IN-LB) | -3.12 | 95.15 | -101.59 | 111. | 90. |

CHIA STUDY -GX TEST: 3516 SUBJ: ADAM-S WT: 143.0 NOM G: 20.0 CELL: H

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -3.26 | 28.38 | -894.62 | 240. | 64. |
| LEFT HORIZ Y AXIS | -1.33 | 161.19 | -6.57 | 64. | 265. |
| LEFT HORIZ Z AXIS | -0.20 | 65.41 | -3.40 | 64. | 206. |
| LEFT RESULTANT | 4.55 | 911.37 | 3.05 | 64. | 0. |
| RIGHT HORIZ X AXIS | -2.13 | 16.95 | -1006.51 | 230. | 62. |
| RIGHT HORIZ Y AXIS | -0.41 | 10.60 | -148.46 | 190. | 63. |
| RIGHT HORIZ Z AXIS | -0.45 | 71.08 | -6.70 | 121. | 404. |
| RIGHT RESULTANT | 2.64 | 1019.02 | 1.89 | 63. | 0. |
| LEFT VERT X AXIS | -1.26 | 0.05 | -172.70 | 0. | 64. |
| LEFT VERT Y AXIS | -0.63 | 66.99 | -2.92 | 65. | 399. |
| LEFT VERT Z AXIS | -5.47 | 17.15 | -203.35 | 30. | 64. |
| LEFT RESULTANT | 5.82 | 274.77 | 0.90 | 64. | 430. |
| RIGHT VERT X AXIS | -3.42 | 3.55 | -116.14 | 236. | 62. |
| RIGHT VERT Y AXIS | -0.56 | 1.76 | -37.90 | 25. | 73. |
| RIGHT VERT Z AXIS | -9.91 | 10.87 | -143.51 | 27. | 69. |
| RIGHT RESULTANT | 10.60 | 185.27 | 1.23 | 69. | 435. |
| ADAM INTERNAL TEMP (DEG C) | 59.70 | 59.83 | 59.08 | 6. | 184. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.69 | 6.85 | -39.56 | 247. | 83. |
| HEAD Z AXIS | 0.87 | 4.21 | -21.47 | 36. | 93. |
| CHEST X AXIS | -0.67 | 8.89 | -29.99 | 240. | 54. |
| LUMBAR X AXIS | 0.86 | 7.51 | -39.71 | 233. | 58. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -1.47 | 360.89 | -55.16 | 83. | 246. |
| NECK Z AXIS | -6.34 | 353.65 | -39.26 | 96. | 43. |
| LUMBAR X AXIS | -5.64 | 158.83 | -340.97 | 244. | 82. |
| ADAM NECK MY TORQUE (IN-LB) | -4.33 | 85.37 | -225.06 | 73. | 56. |

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CHIA STUDY -GX TEST: 3517 SUBJ: ADAM-L WT: 216.0 NOM G: 30.0 CELL: I

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.50 | 32. | 207. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 199. | 77. |
| SELED ACCELERATION (G) | | | | | |
| X AXIS | -0.03 | 0.90 | -29.85 | 149. | 73. |
| Y AXIS | -0.02 | 2.46 | -1.37 | 260. | 309. |
| Z AXIS | 0.95 | 4.25 | -2.83 | 31. | 37. |
| SEAT ACC. ERATION (G) | | | | | |
| X AXIS | 0.52 | 1.87 | -28.91 | 225. | 64. |
| Y AX. | -0.04 | 3.17 | -2.10 | 71. | 9. |
| Z AXI | 0.81 | 18.03 | -0.77 | 64. | 2. |
| RESULTANT | 0.96 | 34.17 | 0.26 | 64. | 202. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.70 | 33.93 | -51.93 | 213. | 64. |
| Y AXIS | 0.24 | 32.54 | -21.57 | 58. | 54. |
| Z AXIS | 0.78 | 58.40 | -16.32 | 62. | 211. |
| RESULTANT | 1.08 | 72.76 | 0.32 | 62. | 188. |
| RY (RAD/SEC2) | -3.95 | 6989.25 | -8111.74 | 218. | 238. |
| SELED VELOCITY (FPS) | 0.02 | 93.85 | 0.00 | 158. | 1. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -9.57 | 3.95 | -939.59 | 189. | 77. |
| LEFT Y AXIS | 2.45 | 9.49 | -66.49 | 227. | 59. |
| LEFT Z AXIS | 2.69 | 56.25 | -2.25 | 77. | 231. |
| LEFT RESULTANT | 10.28 | 942.88 | 1.48 | 78. | 214. |
| RIGHT X AXIS | -8.91 | 6.83 | -819.55 | 232. | 61. |
| RIGHT Y AXIS | 1.15 | 70.27 | -5.68 | 70. | 261. |
| RIGHT Z AXIS | 0.43 | 39.86 | -5.81 | 32. | 231. |
| RIGHT RESULTANT | 9.02 | 822.07 | 1.34 | 62. | 176. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 1.42 | 46.71 | -20.78 | 43. | 82. |
| Z AXIS FORCE (LB) | 11.08 | 1185.90 | -11.22 | 60. | 203. |
| X AXIS TORQUE (IN-LB) | -1.03 | 141.16 | -102.03 | 43. | 75. |

CHIA STUDY -GX TEST: 3517 SUBJ: ADAM-L WT: 216.0 NOM G: 30.0 CELL: I

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -1.08 | 50.35 | -2856.77 | 235. | 68. |
| LEFT HORIZ Y AXIS | -9.93 | 150.85 | -76.33 | 96. | 67. |
| LEFT HORIZ Z AXIS | -1.72 | 110.97 | -4.92 | 65. | 1. |
| LEFT RESULTANT | 10.44 | 2859.81 | 1.42 | 68. | 275. |
| RIGHT HORIZ X AXIS | -10.30 | 52.49 | -2703.94 | 223. | 70. |
| RIGHT HORIZ Y AXIS | 10.05 | 21.06 | -166.27 | 17. | 83. |
| RIGHT HORIZ Z AXIS | -6.71 | 70.81 | -34.02 | 55. | 88. |
| RIGHT RESULTANT | 15.93 | 2704.61 | 2.27 | 70. | 282. |
| LEFT VERT X AXIS | -1.64 | -1.17 | -341.79 | 0. | 66. |
| LEFT VERT Y AXIS | -1.80 | 169.86 | -10.65 | 69. | 223. |
| LEFT VERT Z AXIS | -11.94 | 16.33 | -481.83 | 22. | 68. |
| LEFT RESULTANT | 12.22 | 614.34 | 8.94 | 68. | 395. |
| RIGHT VERT X AXIS | -3.28 | 3.70 | -282.83 | 221. | 69. |
| RIGHT VERT Y AXIS | 1.59 | 12.00 | -81.12 | 227. | 72. |
| RIGHT VERT Z AXIS | -10.63 | 22.64 | -405.12 | 29. | 72. |
| RIGHT RESULTANT | 11.30 | 498.65 | 7.15 | 72. | 394. |
| ADAM INTERNAL TEMP (DEG C) | 77.97 | 78.74 | 77.50 | 36. | 138. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.62 | 11.71 | -75.55 | 241. | 78. |
| HEAD Z AXIS | 0.81 | 5.43 | -52.61 | 43. | 67. |
| CHEST X AXIS | 0.63 | 22.26 | -54.83 | 209. | 59. |
| LUMBAR X AXIS | 0.66 | 7.06 | -36.73 | 211. | 67. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -15.27 | 725.19 | -119.61 | 78. | 241. |
| NECK Z AXIS | -201.80 | 260.07 | -258.65 | 62. | 40. |
| LUMBAR X AXIS | 29.30 | 281.99 | -1959.05 | 215. | 77. |
| ADAM NECK MY TORQUE (IN-LB) | 45.43 | 820.06 | -304.49 | 72. | 229. |

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CHIA STUDY -GX TEST: 3518 SUBJ: ADAM-L WT: 216.0 NOM G: 30.0 CELL: I

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.50 | 214. | 241. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 19. | 148. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 1.03 | -30.03 | 148. | 73. |
| Y AXIS | -0.03 | 2.22 | -1.46 | 252. | 294. |
| Z AXIS | 0.97 | 4.29 | -2.74 | 32. | 38. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 2.22 | -28.21 | 224. | 65. |
| Y AXIS | -0.07 | 3.88 | -2.64 | 72. | 51. |
| Z AXIS | 0.81 | 18.33 | -0.22 | 32. | 149. |
| RESULTANT | 0.95 | 33.71 | 0.16 | 65. | 231. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 1.21 | 18.19 | -58.04 | 215. | 54. |
| Y AXIS | 0.24 | 42.81 | -26.49 | 60. | 54. |
| Z AXIS | 0.57 | 50.51 | -21.89 | 58. | 212. |
| RESULTANT | 1.37 | 76.05 | 0.63 | 54. | 194. |
| RY (RAD/SEC2) | -7.62 | 8666.87 | -11355.70 | 228. | 211. |
| SLED VELOCITY (FPS) | 0.00 | 94.01 | -0.03 | 150. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -8.88 | 8.13 | -998.57 | 215. | 78. |
| LEFT Y AXIS | 1.71 | 8.13 | -67.85 | 183. | 59. |
| LEFT Z AXIS | 2.33 | 58.17 | -1.47 | 65. | 184. |
| LEFT RESULTANT | 9.37 | 1002.06 | 0.86 | 79. | 198. |
| RIGHT X AXIS | -11.21 | 8.66 | -841.56 | 215. | 82. |
| RIGHT Y AXIS | 1.64 | 84.83 | -7.48 | 65. | 266. |
| RIGHT Z AXIS | 0.96 | 40.93 | -4.75 | 32. | 148. |
| RIGHT RESULTANT | 11.39 | 845.05 | 0.91 | 82. | 199. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 4.16 | 92.22 | -17.90 | 50. | 79. |
| Z AXIS FORCE (LB) | 10.99 | 1183.66 | -9.73 | 79. | 229. |
| X AXIS TORQUE (IN-LB) | 4.86 | 239.86 | -156.35 | 50. | 74. |

CHIA STUDY -GX TEST: 3518 SUBJ: ADAM-L WT: 216.0 NOM G: 30.0 CELL: I

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -5.88 | 57.39 | -2636.25 | 225. | 71. |
| LEFT HORIZ Y AXIS | -10.90 | 146.37 | -35.37 | 94. | 71. |
| LEFT HORIZ Z AXIS | 0.62 | 114.01 | -5.51 | 68. | 292. |
| LEFT RESULTANT | 12.59 | 2638.80 | 1.99 | 71. | 207. |
| RIGHT HORIZ X AXIS | -1.37 | 77.35 | -2836.05 | 218. | 73. |
| RIGHT HORIZ Y AXIS | 34.20 | 40.86 | -157.08 | 21. | 91. |
| RIGHT HORIZ Z AXIS | -14.18 | 91.30 | -23.67 | 57. | 76. |
| RIGHT RESULTANT | 37.20 | 2836.45 | 2.54 | 73. | 197. |
| LEPT VERT X AXIS | -1.68 | 2.53 | -406.22 | 224. | 69. |
| LEPT VERT Y AXIS | -1.66 | 209.81 | -12.66 | 70. | 270. |
| LEPT VERT Z AXIS | -13.29 | 17.97 | -582.28 | 24. | 71. |
| LEFT RESULTANT | 13.56 | 740.33 | 6.67 | 71. | 399. |
| RIGHT VERT X AXIS | -2.04 | 8.70 | -237.93 | 217. | 68. |
| RIGHT VERT Y AXIS | 0.07 | 12.14 | -74.08 | 43. | 74. |
| RIGHT VERT Z AXIS | -4.08 | 27.34 | -355.39 | 31. | 73. |
| RIGHT RESULTANT | 4.69 | 424.38 | 2.71 | 74. | 4. |
| ADAM INTERNAL TEMP (DEG C) | 83.95 | 85.45 | 83.70 | 188. | 6. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 1.12 | 12.80 | -81.32 | 216. | 78. |
| HEAD Z AXIS | 0.99 | 8.40 | -67.78 | 50. | 65. |
| CHEST X AXIS | 0.89 | 27.63 | -46.18 | 209. | 63. |
| LUMBAR X AXIS | 0.90 | 8.89 | -49.68 | 211. | 49. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -7.33 | 808.10 | -121.17 | 79. | 241. |
| NECK Z AXIS | 16.87 | 1176.29 | -473.19 | 67. | 76. |
| LUMBAR X AXIS | 9.35 | 291.50 | -2183.32 | 214. | 79. |
| ADAM NECK MY TORQUE (IN-LB) | 18.38 | 1073.24 | -351.97 | 73. | 229. |

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CHIA STUDY -GX TEST: 3519 SUBJ: ADAM-S WT: 143.0 NOM G: 30.0 CELL: I

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -221. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.49 | 49. | 35. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 49. | 50. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.76 | -30.40 | 148. | 68. |
| Y AXIS | -0.01 | 1.16 | -0.41 | 234. | 228. |
| Z AXIS | 1.00 | 3.98 | -2.44 | 30. | 36. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.50 | 1.50 | -27.33 | 152. | 77. |
| Y AXIS | -0.04 | 1.98 | -2.13 | 72. | 220. |
| Z AXIS | 0.84 | 19.39 | 0.19 | 66. | 150. |
| RESULTANT | 0.98 | 33.26 | 0.41 | 65. | 188. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.57 | 8.37 | -38.21 | 201. | 74. |
| Y AXIS | 0.13 | 2.76 | -15.12 | 209. | 72. |
| Z AXIS | 0.87 | 36.73 | -8.60 | 81. | 217. |
| RESULTANT | 1.05 | 47.57 | 0.30 | 49. | 162. |
| RY (RAD/SEC2) | -1.27 | 3574.11 | -2860.63 | 80. | 89. |
| SLED VELOCITY (FPS) | 0.02 | 93.89 | -0.03 | 148. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | 1.21 | 7.89 | -596.13 | 217. | 75. |
| LEFT Y AXIS | 2.12 | 9.02 | -37.02 | 230. | 59. |
| LEFT Z AXIS | 1.53 | 50.67 | -2.09 | 54. | 188. |
| LEFT RESULTANT | 3.27 | 598.94 | 0.96 | 75. | 345. |
| RIGHT X AXIS | -4.05 | 7.87 | -647.67 | 295. | 78. |
| RIGHT Y AXIS | 0.74 | 44.38 | -5.87 | 76. | 349. |
| RIGHT Z AXIS | 0.68 | 39.28 | -3.86 | 31. | 355. |
| RIGHT RESULTANT | 4.30 | 649.83 | 0.10 | 78. | 173. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -0.03 | 57.01 | -12.26 | 39. | 218. |
| Z AXIS FORCE (LB) | 3.10 | 871.73 | -7.41 | 73. | 180. |
| X AXIS TORQUE (IN-LB) | 6.83 | 228.05 | -45.20 | 38. | 235. |

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CHIA STUDY -GX TEST: 3519 SUBJ: ADAM-S WT: 143.0 NOM G: 30.0 CELL: I

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -3.70 | 26.25 | -1687.89 | 221. | 73. |
| LEFT HORIZ Y AXIS | -1.27 | 234.38 | -13.77 | 110. | 244. |
| LEFT HORIZ Z AXIS | -0.28 | 75.91 | -7.39 | 30. | 184. |
| LEFT RESULTANT | 4.82 | 1688.24 | 1.16 | 73. | 270. |
| RIGHT HORIZ X AXIS | -0.13 | 24.74 | -1538.70 | 226. | 72. |
| RIGHT HORIZ Y AXIS | 1.29 | 8.77 | -252.80 | 235. | 83. |
| RIGHT HORIZ Z AXIS | -0.47 | 70.54 | -7.24 | 31. | 60. |
| RIGHT RESULTANT | 1.98 | 1552.09 | 1.80 | 72. | 0. |
| LEFT VERT X AXIS | -2.19 | 0.24 | -153.04 | 216. | 55. |
| LEFT VERT Y AXIS | 1.22 | 77.55 | -7.63 | 70. | 354. |
| LEFT VERT Z AXIS | -16.97 | 16.17 | -192.08 | 22. | 70. |
| LEFT RESULTANT | 17.18 | 250.51 | 4.95 | 71. | 373. |
| RIGHT VERT X AXIS | 0.05 | 3.12 | -170.98 | 200. | 67. |
| RIGHT VERT Y AXIS | -1.65 | 6.97 | -65.46 | 33. | 69. |
| RIGHT VERT Z AXIS | -14.84 | 22.51 | -218.70 | 29. | 67. |
| RIGHT RESULTANT | 15.03 | 283.71 | 3.26 | 67. | 375. |
| ADAM INTERNAL TEMP (DEG C) | 83.37 | 84.61 | 82.86 | 49. | 144. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.40 | 34.67 | -80.96 | 235. | 75. |
| HEAD Z AXIS | 0.92 | 7.12 | -54.91 | 34. | 61. |
| CHEST X AXIS | 0.22 | 10.04 | -39.11 | 205. | 45. |
| LUMBAR X AXIS | 0.53 | 5.65 | -53.12 | 203. | 50. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | 3.37 | 780.03 | -56.95 | 75. | 214. |
| NECK Z AXIS | -15.15 | 446.57 | -67.02 | 80. | 33. |
| LUMBAR X AXIS | 5.91 | 197.22 | -1080.05 | 38. | 77. |
| ADAM NECK MY TORQUE (IN-LB) | -4.57 | 348.70 | -318.74 | 71. | 51. |

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CHIA STUDY -GX TEST: 3520 SUBJ: ADAM-S WT: 143.0 NOM G: 30.0 CELL: I

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -228. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.49 | 33. | 242. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 10. | 30. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.04 | 0.70 | -30.15 | 150. | 69. |
| Y AXIS | 0.02 | 2.18 | -1.06 | 250. | 208. |
| Z AXIS | 0.97 | 3.89 | -2.31 | 32. | 38. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.49 | 1.56 | -27.09 | 152. | 73. |
| Y AXIS | -0.06 | 2.78 | -1.20 | 87. | 259. |
| Z AXIS | 0.82 | 19.09 | 0.11 | 66. | 195. |
| RESULTANT | 0.96 | 32.72 | 0.78 | 66. | 324. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 17.26 | -45.00 | 203. | 48. |
| Y AXIS | 0.11 | 4.80 | -11.86 | 227. | 73. |
| Z AXIS | 0.96 | 30.56 | -4.81 | 42. | 221. |
| RESULTANT | 1.08 | 53.86 | 0.41 | 49. | 296. |
| RY (RAD/SEC2) | -12.20 | 1853.08 | -2105.58 | 230. | 203. |
| SLED VELOCITY (PPS) | 0.01 | 93.71 | 0.05 | 149. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | 0.60 | 9.71 | -621.95 | 226. | 76. |
| LEFT Y AXIS | 5.67 | 9.26 | -26.43 | 184. | 60. |
| LEFT Z AXIS | 6.03 | 56.36 | 3.60 | 72. | 195. |
| LEFT RESULTANT | 8.50 | 624.88 | 4.19 | 76. | 339. |
| RIGHT X AXIS | -5.11 | 4.21 | -552.01 | 191. | 56. |
| RIGHT Y AXIS | 1.90 | 27.88 | -3.67 | 78. | 319. |
| RIGHT Z AXIS | 1.91 | 42.65 | -3.02 | 34. | 326. |
| RIGHT RESULTANT | 5.90 | 553.93 | 0.56 | 56. | 168. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -1.61 | 63.83 | -10.76 | 47. | 339. |
| Z AXIS FORCE (LB) | 2.44 | 804.17 | -11.37 | 75. | 349. |
| X AXIS TORQUE (IN-LB) | 3.22 | 123.45 | -92.41 | 38. | 61. |

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CHIA STUDY -GX TEST: 3520 SUBJ: ADAM-S WT: 143.0 NOM G: 30.0 CELL: I

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -6.74 | 19.34 | -1374.57 | 211. | 78. |
| LEFT HORIZ Y AXIS | -2.83 | 216.56 | -10.62 | 90. | 233. |
| LEFT HORIZ Z AXIS | 1.67 | 128.57 | -9.06 | 57. | 349. |
| LEFT RESULTANT | 7.72 | 1387.37 | 1.88 | 78. | 264. |
| RIGHT HORIZ X AXIS | -0.85 | 31.27 | -1406.60 | 226. | 72. |
| RIGHT HORIZ Y AXIS | -0.14 | 7.07 | -243.89 | 230. | 81. |
| RIGHT HORIZ Z AXIS | -0.06 | 108.33 | -10.08 | 102. | 352. |
| RIGHT RESULTANT | 1.37 | 1437.3 | 0.14 | 72. | 0. |
| LEFT VERT X AXIS | -0.89 | 2.48 | -211.63 | 217. | 60. |
| LEFT VERT Y AXIS | -0.46 | 103.84 | -8.03 | 74. | 260. |
| LEFT VERT Z AXIS | -2.71 | 21.48 | -248.02 | 32. | 72. |
| LEFT RESULTANT | 3.23 | 339.18 | 2.64 | 74. | 3. |
| RIGHT VERT X AXIS | -3.40 | 4.14 | -191.72 | 211. | 62. |
| RIGHT VERT Y AXIS | -1.01 | 8.21 | -43.52 | 35. | 70. |
| RIGHT VERT Z AXIS | -11.08 | 14.15 | -198.12 | 22. | 64. |
| RIGHT RESULTANT | 11.70 | 275.63 | 3.89 | 64. | 380. |
| ADAM INTERNAL TEMP (DEG C) | 62.08 | 62.83 | 61.83 | 13. | 2. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.75 | 10.05 | -68.88 | 249. | 75. |
| HEAD Z AXIS | 0.73 | 6.75 | -45.80 | 39. | 61. |
| CHEST X AXIS | -1.07 | 13.14 | -43.17 | 204. | 47. |
| LUMBAR X AXIS | 1.05 | 9.26 | -60.08 | 203. | 50. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -5.10 | 640.30 | -82.92 | 75. | 212. |
| NECK Z AXIS | 5.13 | 438.52 | -58.24 | 82. | 31. |
| LUMBAR X AXIS | 54.91 | 205.95 | -868.85 | 41. | 76. |
| ADAM NECK MY TORQUE (IN-LB) | -60.99 | 272.87 | -351.88 | 70. | 51. |

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CHIA STUDY -GX TEST: 3521 SUBJ: ADAM-L WT: 216.0 NOM G: 40.0 CELL: J

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -263. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.49 | 177. | 178. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 177. | 178. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | 0.00 | 1.00 | -40.28 | 130. | 64. |
| Y AXIS | 0.00 | 1.59 | -2.30 | 48. | 104. |
| Z AXIS | 0.98 | 4.75 | -2.98 | 26. | 32. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.44 | 2.77 | -38.13 | 132. | 66. |
| Y AXIS | -0.04 | 5.30 | -4.76 | 68. | 45. |
| Z AXIS | 0.95 | 25.03 | -0.37 | 60. | 132. |
| RESULTANT | 0.96 | 45.10 | 0.97 | 60. | 161. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 1.02 | 7.67 | -71.98 | 190. | 48. |
| Y AXIS | 0.18 | 64.72 | -49.56 | 55. | 60. |
| Z AXIS | 0.70 | 55.56 | -5.88 | 55. | 190. |
| RESULTANT | 1.25 | 87.23 | 0.64 | 55. | 162. |
| RY (RAD/SEC2) | 12.84 | 10895.33 | -12214.68 | 69. | 60. |
| SLED VELOCITY (FPS) | 0.02 | 107.47 | -0.01 | 142. | 2. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -2.98 | 5.53 | -1147.25 | 168. | 64. |
| LEFT Y AXIS | 0.00 | 4.60 | -86.34 | 127. | 53. |
| LEFT Z AXIS | 0.83 | 76.57 | -2.57 | 63. | 149. |
| LEFT RESULTANT | 3.13 | 1151.21 | 1.60 | 64. | 186. |
| RIGHT X AXIS | -6.29 | 5.32 | -1373.30 | 177. | 72. |
| RIGHT Y AXIS | 0.81 | 128.44 | -7.10 | 71. | 161. |
| RIGHT Z AXIS | -0.19 | 46.99 | -6.29 | 27. | 131. |
| RIGHT RESULTANT | 6.39 | 1379.47 | 1.73 | 72. | 170. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 1.54 | 115.41 | -28.45 | 82. | 111. |
| Z AXIS FORCE (LB) | 7.41 | 1515.04 | -18.78 | 58. | 181. |
| X AXIS TORQUE (IN-LB) | 2.73 | 830.57 | -27.43 | 75. | 181. |

CHIA STUDY -GX TEST: 3521 SUBJ: ADAM-L WT: 216.0 NOM G: 40.0 CELL: J

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -0.49 | 37.67 | -4363.83 | 188. | 65. |
| LEFT HORIZ Y AXIS | -23.77 | 173.57 | -340.21 | 91. | 64. |
| LEFT HORIZ Z AXIS | 1.77 | 127.56 | -17.31 | 60. | 182. |
| LEFT RESULTANT | 23.96 | 4378.34 | 4.58 | 65. | 179. |
| RIGHT HORIZ X AXIS | 1.89 | 46.09 | -3388.47 | 178. | 68. |
| RIGHT HORIZ Y AXIS | 17.81 | 92.04 | -162.45 | 68. | 32. |
| RIGHT HORIZ Z AXIS | -11.86 | 117.68 | -37.88 | 50. | 75. |
| RIGHT RESULTANT | 21.56 | 3389.74 | 4.20 | 68. | 173. |
| LEFT VERT X AXIS | | | | | |
| LEFT VERT Y AXIS | -4.32 | -4.14 | -476.15 | 0. | 66. |
| LEFT VERT Z AXIS | -2.42 | 273.45 | -6.23 | 65. | 31. |
| LEFT RESULTANT | -24.90 | 28.34 | -710.75 | 23. | 66. |
| RIGHT VERT X AXIS | 25.40 | 896.60 | 20.14 | 66. | 6. |
| RIGHT VERT Y AXIS | 0.02 | 6.89 | -551.67 | 177. | 67. |
| RIGHT VERT Z AXIS | -1.03 | 13.83 | -179.30 | 39. | 71. |
| RIGHT RESULTANT | -7.15 | 34.41 | -805.02 | 26. | 71. |
| RIGHT RESULTANT | 7.35 | 988.22 | 4.52 | 71. | 2. |
| ADAM INTERNAL TEMP (DEG C) | -258.91 | -253.36 | -260.11 | 177. | 181. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.49 | 4.59 | -98.80 | 177. | 73. |
| HEAD Z AXIS | 1.05 | 28.24 | -99.94 | 44. | 59. |
| CHEST X AXIS | 0.81 | 17.23 | -60.44 | 190. | 58. |
| LUMBAR X AXIS | 0.66 | 6.46 | -93.20 | 190. | 43. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -20.71 | 976.68 | -53.01 | 73. | 190. |
| NECK Z AXIS | 11.06 | 1143.19 | -1665.86 | 60. | 85. |
| LUMBAR X AXIS | 0.48 | 250.38 | -3173.66 | 42. | 73. |
| ADAM NECK MY TORQUE (IN-LB) | -1.39 | 1439.89 | -395.31 | 67. | 54. |

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CHIA STUDY -GX TEST: 3523 SUBJ: ADAM-S VT: 143.0 NOM G: 40.0 CELL: J

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -279. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.50 | 2.49 | 67. | 55. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 67. | 55. |
| SELED ACCELERATION (G) | | | | | |
| X AXIS | -0.03 | 1.01 | -0.47 | 169. | 64. |
| Y AXIS | -0.02 | 1.55 | -0.73 | 207. | 110. |
| Z AXIS | 1.01 | 4.73 | 1.90 | 28. | 34. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.50 | 2.98 | -37.74 | 132. | 69. |
| Y AXIS | -0.05 | 5.48 | -2.62 | 70. | 58. |
| Z AXIS | 0.82 | 24.64 | -0.66 | 61. | 132. |
| RESULTANT | 0.96 | 44.48 | 0.46 | 69. | 253. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.62 | 26.02 | -61.70 | 191. | 66. |
| Y AXIS | 0.15 | 18.19 | -5.91 | 65. | 55. |
| Z AXIS | 0.06 | 59.95 | -14.90 | 72. | 194. |
| RESULTANT | 1.07 | 70.23 | 0.55 | 72. | 305. |
| RY (RAD/SEC2) | -1.55 | 7213.62 | -6114.38 | 191. | 182. |
| SLED VELOCITY (FPS) | 0.00 | 106.84 | -0.02 | 160. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -7.66 | 5.13 | -824.87 | 211. | 65. |
| LEFT Y AXIS | 5.29 | 9.14 | -31.15 | 127. | 56. |
| LEFT Z AXIS | 5.30 | 6.63 | 1.19 | 63. | 213. |
| LEFT RESULTANT | 10.75 | 918.98 | 4.76 | 65. | 158. |
| RIGHT X AXIS | -5.11 | 9.93 | -892.97 | 150. | 66. |
| RIGHT Y AXIS | 1.23 | 67.98 | -4.46 | 68. | 160. |
| RIGHT Z AXIS | 1.35 | 50.70 | -2.59 | 29. | 132. |
| RIGHT RESULTANT | 5.64 | 896.47 | 1.56 | 67. | 154. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -1.92 | 54.92 | -49.87 | 68. | 43. |
| Z AXIS FORCE (LB) | 7.05 | 1197.13 | -11.22 | 64. | 215. |
| X AXIS TORQUE (IN-LB) | -7.66 | 242.15 | -99.41 | 68. | 36. |

CHIA STUDY -GX TEST: 3523 SUBJ: ADAM-S WT: 143.0 NOM G: 40.0 CELL: J

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -3.85 | 69.32 | -2379.45 | 216. | 64. |
| LEFT HORIZ Y AXIS | -2.51 | 228.30 | -110.72 | 97. | 65. |
| LEFT HORIZ Z AXIS | 1.73 | 64.83 | -36.58 | 28. | 47. |
| LEFT RESULTANT | 5.79 | 2382.12 | 1.20 | 65. | 266. |
| RIGHT HORIZ X AXIS | -5.90 | 50.61 | -2322.81 | 208. | 67. |
| RIGHT HORIZ Y AXIS | 3.19 | 24.53 | -233.50 | 192. | 81. |
| RIGHT HORIZ Z AXIS | 0.01 | 206.41 | -3.25 | 74. | 150. |
| RIGHT RESULTANT | 6.77 | 2329.91 | 3.35 | 67. | 163. |
| LEFT VERT X AXIS | -4.05 | -1.90 | -213.57 | 1. | 59. |
| LEFT VERT Y AXIS | 4.44 | 97.10 | 0.48 | 58. | 32. |
| LEFT VERT Z AXIS | -32.42 | 12.50 | -261.09 | 20. | 58. |
| LEFT RESULTANT | 32.99 | 350.32 | 18.32 | 59. | 329. |
| RIGHT VERT X AXIS | -1.25 | 3.63 | -221.25 | 182. | 59. |
| RIGHT VERT Y AXIS | -0.33 | 6.83 | -103.53 | 31. | 63. |
| RIGHT VERT Z AXIS | -12.87 | 32.16 | -254.08 | 28. | 57. |
| RIGHT RESULTANT | 13.06 | 349.56 | 10.31 | 61. | 2. |
| ADAM INTERNAL TEMP (DEG C) | 64.71 | 112.47 | -297.12 | 68. | 62. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.71 | 71.31 | -57.80 | 208. | 68. |
| HEAD Z AXIS | 0.82 | 6.39 | -71.05 | 30. | 56. |
| CHEST X AXIS | -1.00 | 15.92 | -49.93 | 185. | 53. |
| LUMBAR X AXIS | 1.01 | 9.68 | -67.46 | 182. | 45. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -6.41 | 1012.34 | -76.55 | 69. | 194. |
| NECK Z AXIS | 17.90 | 1241.32 | -38.45 | 62. | 29. |
| LUMBAR X AXIS | 44.39 | 638.47 | -670.53 | 87. | 57. |
| ADAM NECK MY TORQUE (IN-LB) | -38.31 | 668.52 | -344.27 | 62. | 46. |

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CHIA STUDY -GX TEST: 3524 SUBJ: ADAM-S WT: 143.0 NOM G: 40.0 CELL: J

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.49 | 63. | 252. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 176. | 28. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.04 | 2.74 | -41.03 | 163. | 65. |
| Y AXIS | 0.00 | 2.35 | -1.45 | 232. | 268. |
| Z AXIS | 0.96 | 2.60 | -1.64 | 41. | 46. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.39 | 4.73 | -37.85 | 133. | 74. |
| Y AXIS | -0.06 | 4.69 | -2.23 | 41. | 202. |
| Z AXIS | 0.81 | 24.42 | -2.36 | 62. | 133. |
| RESULTANT | 0.90 | 44.23 | 0.92 | 60. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.64 | 18.78 | -58.54 | 180. | 45. |
| Y AXIS | 0.13 | 12.28 | -19.58 | 38. | 46. |
| Z AXIS | 0.75 | 40.36 | -11.95 | 47. | 186. |
| RESULTANT | 1.00 | 70.64 | 0.58 | 46. | 149. |
| RY (RAD/SEC2) | -16.76 | 5815.41 | -4134.73 | 194. | 180. |
| SLED VELOCITY (PPS) | 0.02 | 107.26 | -0.03 | 132. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -4.65 | 15.24 | -853.29 | 154. | 70. |
| LEFT Y AXIS | 5.71 | 16.03 | -32.32 | 165. | 56. |
| LEFT Z AXIS | 8.03 | 84.87 | 1.15 | 64. | 133. |
| LEFT RESULTANT | 10.92 | 857.27 | 3.70 | 70. | 207. |
| RIGHT X AXIS | -3.51 | 8.10 | -798.41 | 153. | 74. |
| RIGHT Y AXIS | 0.67 | 55.46 | -8.81 | 74. | 203. |
| RIGHT Z AXIS | 0.85 | 45.60 | -8.96 | 66. | 133. |
| RIGHT RESULTANT | 3.81 | 801.30 | 0.65 | 74. | 176. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -6.68 | 64.30 | -33.39 | 210. | 85. |
| Z AXIS FORCE (LB) | 1.94 | 1127.99 | -46.69 | 71. | 215. |
| X AXIS TORQUE (IN-LB) | -8.64 | 233.19 | -81.05 | 210. | 64. |

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CHIA STUDY -GX TEST: 3524 SUBJ: ADAM-S WT: 143.0 NOM G: 40.0 CELL: J

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -11.93 | 101.09 | -1883.04 | 182. | 50. |
| LEFT HORIZ Y AXIS | -2.51 | 212.71 | -52.92 | 87. | 184. |
| LEFT HORIZ Z AXIS | -1.53 | 126.76 | -21.73 | 86. | 132. |
| LEFT RESULTANT | 12.56 | 1884.45 | 3.71 | 51. | 239. |
| RIGHT HORIZ X AXIS | -16.90 | 113.27 | -2165.97 | 185. | 50. |
| RIGHT HORIZ Y AXIS | -1.01 | 35.56 | -204.80 | 191. | 56. |
| RIGHT HORIZ Z AXIS | -0.08 | 232.99 | -13.86 | 51. | 167. |
| RIGHT RESULTANT | 17.03 | 2183.99 | 0.47 | 50. | 249. |
| LEFT VERT X AXIS | -1.99 | 27.30 | -181.94 | 186. | 60. |
| LEFT VERT Y AXIS | -2.35 | 47.09 | -3.76 | 59. | 12. |
| LEFT VERT Z AXIS | -7.36 | 20.91 | -273.09 | 20. | 184. |
| LEFT RESULTANT | 8.03 | 276.15 | 6.15 | 186. | 3. |
| RIGHT VERT X AXIS | -3.71 | 21.54 | -152.55 | 184. | 53. |
| RIGHT VERT Y AXIS | -0.34 | 5.04 | -36.35 | 30. | 66. |
| RIGHT VERT Z AXIS | -0.25 | 25.73 | -260.52 | 25. | 186. |
| RIGHT RESULTANT | 3.88 | 262.53 | 3.85 | 186. | 0. |
| ADAM INTERNAL TEMP (DEG C) | 60.39 | 61.73 | 60.23 | 256. | 6. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.82 | 102.72 | -81.34 | 209. | 71. |
| HEAD Z AXIS | 0.86 | 6.05 | -64.08 | 32. | 58. |
| CHEST X AXIS | -0.68 | 18.93 | -51.06 | 178. | 76. |
| LUMBAR X AXIS | 1.01 | 22.91 | -72.21 | 174. | 46. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -7.60 | 782.31 | -69.30 | 71. | 189. |
| NECK Z AXIS | -7.10 | 601.97 | -49.14 | 76. | 32. |
| LUMBAR X AXIS | -1.22 | 325.27 | -436.33 | 40. | 73. |
| ADAM NECK MY TORQUE (IN-LB) | -11.55 | 376.79 | -313.93 | 67. | 47. |

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CHIA STUDY -GX TEST: 3525 SUBJ: ADAM-L WT: 216.0 NOM G: 40.0 CELL: J

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -210. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.52 | 2.49 | 195. | 96. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 170. | 69. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.96 | -40.91 | 129. | 63. |
| Y AXIS | -0.02 | 1.76 | -2.16 | 47. | 180. |
| Z AXIS | 1.00 | 4.82 | -3.05 | 27. | 33. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.46 | 4.34 | -38.69 | 208. | 48. |
| Y AXIS | -0.04 | 10.21 | -3.69 | 63. | 43. |
| Z AXIS | 0.84 | 26.29 | -1.15 | 60. | 163. |
| RESULTANT | 0.96 | 45.33 | 0.39 | 49. | 366. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.71 | 26.84 | -86.19 | 202. | 74. |
| Y AXIS | 0.29 | 27.46 | -34.71 | 57. | 52. |
| Z AXIS | 0.72 | 70.90 | -17.44 | 53. | 224. |
| RESULTANT | 1.06 | 98.35 | 0.47 | 52. | 170. |
| RY (RAD/SEC2) | -3.15 | 14017.94 | -14777.88 | 78. | 199. |
| SLED VELOCITY (PPS) | 0.00 | 107.63 | -0.04 | 143. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -2.24 | 18.87 | -1252.34 | 207. | 72. |
| LEFT Y AXIS | -0.29 | 13.79 | -99.03 | 159. | 73. |
| LEFT Z AXIS | -0.13 | 74.51 | -5.78 | 70. | 164. |
| LEFT RESULTANT | 2.35 | 1258.21 | 0.87 | 72. | 231. |
| RIGHT X AXIS | -4.16 | 19.07 | -1335.72 | 207. | 72. |
| RIGHT Y AXIS | 0.29 | 126.17 | -15.21 | 69. | 186. |
| RIGHT Z AXIS | -0.36 | 48.34 | -7.49 | 28. | 132. |
| RIGHT RESULTANT | 4.40 | 1339.55 | 0.81 | 72. | 1. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -0.01 | 76.09 | -26.93 | 68. | 72. |
| Z AXIS FORCE (LB) | 3.53 | 1620.09 | -25.96 | 68. | 204. |
| X AXIS TORQUE (IN-LB) | 0.04 | 341.18 | -11.31 | 47. | 134. |

CHIA STUDY -GX TEST: 3525 SUBJ: ADAM-L WT: 216.0 NOM G: 40.0 CELL: J

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | -5.93 | 122.06 | -3965.50 | 210. | 71. |
| LEFT HORIZ Y AXIS | -25.82 | 158.75 | -260.67 | 88. | 72. |
| LEFT HORIZ Z AXIS | -3.56 | 285.90 | -11.08 | 68. | 164. |
| LEFT RESULTANT | 26.93 | 3977.96 | 3.14 | 71. | 376. |
| RIGHT HORIZ X AXIS | -6.42 | 49.85 | -3453.77 | 202. | 71. |
| RIGHT HORIZ Y AXIS | 18.30 | 209.04 | -165.63 | 68. | 85. |
| RIGHT HORIZ Z AXIS | -8.82 | 337.14 | -14.54 | 48. | 336. |
| RIGHT RESULTANT | 21.40 | 3459.64 | 1.19 | 71. | 302. |
| LEFT VERT X AXIS | -1.25 | 10.07 | -284.32 | 171. | 71. |
| LEFT VERT Y AXIS | -1.60 | 101.47 | -14.21 | 74. | 225. |
| LEFT VERT Z AXIS | -2.68 | 32.50 | -281.91 | 25. | 72. |
| LEFT RESULTANT | 3.86 | 411.24 | 2.58 | 72. | 0. |
| RIGHT VERT X AXIS | -1.27 | 16.03 | -386.57 | 206. | 71. |
| RIGHT VERT Y AXIS | -0.72 | 19.24 | -104.91 | 50. | 72. |
| RIGHT VERT Z AXIS | -0.98 | 32.42 | -466.09 | 26. | 72. |
| RIGHT RESULTANT | 2.85 | 612.28 | 2.57 | 72. | 0. |
| ADAM INTERNAL TEMP (DEG C) | -258.60 | -255.35 | -259.10 | 68. | 71. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | -0.04 | 27.96 | -101.02 | 221. | 74. |
| HEAD Z AXIS | 0.91 | 28.73 | -103.87 | 45. | 76. |
| CHEST X AXIS | 0.28 | 38.77 | -65.53 | 198. | 56. |
| LUMBAR X AXIS | 0.33 | 18.53 | -98.53 | 199. | 44. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -11.58 | 959.62 | -146.58 | 75. | 205. |
| NECK Z AXIS | 14.58 | 1153.73 | -188.36 | 74. | 45. |
| LUMBAR X AXIS | 15.66 | 427.41 | -2394.04 | 201. | 75. |
| ADAM NECK MY TORQUE (IN-LB) | -3.37 | 1441.22 | -347.13 | 70. | 61. |

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CHIA STUDY -GX TEST: 3526 SUBJ: ADAM-S WT: 143.0 NOM G: 45.0 CELL: K

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.51 | 2.50 | 74. | 196. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 198. | 39. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | 0.00 | 1.10 | -44.66 | 266. | 62. |
| Y AXIS | -0.01 | 3.14 | -1.61 | 186. | 180. |
| Z AXIS | 0.99 | 4.83 | -2.79 | 25. | 31. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.45 | 2.85 | -45.85 | 126. | 48. |
| Y AXIS | -0.03 | 7.17 | -4.17 | 66. | 48. |
| Z AXIS | 0.84 | 25.18 | -0.30 | 48. | 128. |
| RESULTANT | 0.95 | 52.48 | 0.59 | 48. | 351. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.69 | 19.13 | -91.11 | 189. | 61. |
| Y AXIS | 0.19 | 19.71 | -7.00 | 69. | 201. |
| Z AXIS | 0.85 | 83.40 | -12.08 | 68. | 192. |
| RESULTANT | 1.12 | 93.94 | 0.64 | 69. | 279. |
| RY (RAD/SEC2) | -1.20 | 7549.89 | -9476.94 | 42. | 181. |
| SLED VELOCITY (FPS) | 0.02 | 111.78 | 0.03 | 156. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -0.69 | 11.60 | -896.40 | 148. | 67. |
| LEFT Y AXIS | 1.64 | 14.97 | -48.35 | 200. | 52. |
| LEFT Z AXIS | 1.24 | 79.23 | -2.20 | 61. | 127. |
| LEFT RESULTANT | 2.43 | 899.77 | 0.26 | 67. | 182. |
| RIGHT X AXIS | -3.28 | 8.18 | -865.87 | 162. | 68. |
| RIGHT Y AXIS | 0.26 | 53.96 | -16.15 | 64. | 189. |
| RIGHT Z AXIS | 0.24 | 50.70 | -3.86 | 27. | 265. |
| RIGHT RESULTANT | 3.40 | 868.48 | 0.32 | 68. | 148. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | -0.47 | 55.27 | -28.20 | 96. | 190. |
| Z AXIS FORCE (LB) | 3.29 | 1170.34 | -4.34 | 63. | 154. |
| X AXIS TORQUE (IN-LB) | 2.62 | 182.86 | -87.66 | 93. | 214. |

CHIA STUDY -GX TEST: 3526 SUBJ: ADAM-S WT: 143.0 NOM G: 45.0 CELL: K

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | 0.01 | 31.64 | -2335.50 | 195. | 63. |
| LEFT HORIZ Y AXIS | -2.04 | 212.64 | -25.03 | 85. | 195. |
| LEFT HORIZ Z AXIS | -0.60 | 94.82 | -10.21 | 51. | 163. |
| LEFT RESULTANT | 2.98 | 2337.44 | 0.89 | 63. | 0. |
| RIGHT HORIZ X AXIS | -1.62 | 30.26 | -2205.02 | 190. | 63. |
| RIGHT HORIZ Y AXIS | -0.50 | 17.18 | -237.32 | 202. | 44. |
| RIGHT HORIZ Z AXIS | -1.34 | 122.34 | -12.92 | 90. | 160. |
| RIGHT RESULTANT | 3.81 | 2209.37 | 1.38 | 63. | 0. |
| LEFT VERT X AXIS | -1.24 | 1.85 | -324.18 | 360. | 60. |
| LEFT VERT Y AXIS | -1.54 | 180.64 | -12.59 | 62. | 368. |
| LEFT VERT Z AXIS | -11.61 | 24.83 | -412.09 | 24. | 60. |
| LEFT RESULTANT | 11.83 | 553.74 | 4.05 | 61. | 399. |
| RIGHT VERT X AXIS | 0.13 | 10.74 | -337.46 | 190. | 59. |
| RIGHT VERT Y AXIS | -2.08 | 7.14 | -144.61 | 371. | 61. |
| RIGHT VERT Z AXIS | -3.53 | 28.75 | -437.60 | 22. | 60. |
| RIGHT RESULTANT | 4.48 | 570.35 | 0.34 | 60. | 348. |
| ADAM INTERNAL TEMP (DEG C) | 66.95 | 68.89 | 66.39 | 33. | 239. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.68 | 64.09 | -119.77 | 213. | 65. |
| HEAD Z AXIS | 0.66 | 19.49 | -95.29 | 40. | 54. |
| CHEST X AXIS | -0.92 | 12.63 | -68.66 | 180. | 41. |
| LUMBAR X AXIS | 0.83 | 18.20 | -86.99 | 55. | 40. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -3.56 | 1137.78 | -61.63 | 65. | 190. |
| NECK Z AXIS | -2.53 | 950.28 | -128.82 | 68. | 40. |
| LUMBAR X AXIS | 8.85 | 333.20 | -2181.67 | 39. | 67. |
| ADAM NECK MY TORQUE (IN-LB) | -4.66 | 717.10 | -458.57 | 62. | 45. |

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CHIA STUDY -GX TEST: 3527 SUBJ: ADAM-L WT: 216.0 NOM G: 45.0 CELL: K

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK TIME (MS) | | | | -179. | |
| 2.5V EXT POWER (VOLTS) | 2.50 | 2.52 | 2.49 | 85. | 11. |
| 10V EXT POWER (VOLTS) | 10.00 | 10.00 | 10.00 | 270. | 8. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | 0.00 | 2.44 | -43.87 | 167. | 62. |
| Y AXIS | -0.02 | 2.74 | -2.31 | 188. | 177. |
| Z AXIS | 0.97 | 5.10 | -3.54 | 33. | 38. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.54 | 4.63 | -41.85 | 159. | 57. |
| Y AXIS | -0.05 | 7.85 | -4.98 | 203. | 180. |
| Z AXIS | 0.81 | 24.76 | -2.50 | 33. | 186. |
| RESULTANT | 0.97 | 47.72 | 0.62 | 57. | 360. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS | 0.83 | 67.13 | -75.25 | 180. | 67. |
| Y AXIS | 0.32 | 26.65 | -48.41 | 41. | 49. |
| Z AXIS | 0.83 | 49.68 | -46.13 | 49. | 181. |
| RESULTANT | 1.23 | 84.64 | 0.44 | 54. | 318. |
| RY (RAD/SEC2) | -9.33 | 14017.64 | -11874.14 | 42. | 47. |
| SLED VELOCITY (FPS) | 0.03 | 111.57 | 0.00 | 132. | 0. |
| SHOULDER POINT FORCES (LB) | | | | | |
| LEFT X AXIS | -2.05 | 7.82 | -1342.36 | 191. | 67. |
| LEFT Y AXIS | 4.13 | 22.06 | -109.18 | 212. | 51. |
| LEFT Z AXIS | 3.77 | 81.41 | -4.61 | 66. | 137. |
| LEFT RESULTANT | 6.37 | 1348.38 | 0.97 | 68. | 189. |
| RIGHT X AXIS | -6.34 | 21.93 | -1225.58 | 185. | 68. |
| RIGHT Y AXIS | 1.54 | 105.98 | -15.54 | 63. | 236. |
| RIGHT Z AXIS | 1.19 | 53.26 | -10.18 | 33. | 186. |
| RIGHT RESULTANT | 6.69 | 1229.08 | 2.08 | 68. | 387. |
| SHOULDER ROLLER | | | | | |
| Y AXIS FORCE (LB) | 1.74 | 23.12 | -40.82 | 63. | 105. |
| Z AXIS FORCE (LB) | 4.79 | 1699.47 | -28.88 | 65. | 185. |
| X AXIS TORQUE (IN-LB) | 8.72 | 46.24 | -248.87 | 222. | 55. |

CHIA STUDY -GX TEST: 3527 SURJ: ADAM-L WT: 216.0 NOM G: 45.0 CELL: K

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-----------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| HARNESS ANCHOR FORCES (LB) | | | | | |
| LEFT HORIZ X AXIS | 0.37 | 56.88 | -3716.73 | 234. | 66. |
| LEFT HORIZ Y AXIS | -19.08 | 140.08 | -251.37 | 82. | 66. |
| LEFT HORIZ Z AXIS | -0.48 | 105.25 | -202.60 | 49. | 70. |
| LEFT RESULTANT | 19.14 | 3727.76 | 10.20 | 66. | 369. |
| RIGHT HORIZ X AXIS | 0.23 | 144.16 | -4313.85 | 231. | 64. |
| RIGHT HORIZ Y AXIS | 18.28 | 250.75 | -173.41 | 64. | 83. |
| RIGHT HORIZ Z AXIS | -13.40 | 98.07 | -57.49 | 47. | 75. |
| RIGHT RESULTANT | 22.75 | 4321.17 | 4.75 | 64. | 174. |
| LEFT VERT X AXIS | -1.59 | 9.64 | -754.34 | 217. | 60. |
| LEFT VERT Y AXIS | -2.46 | 269.63 | -20.21 | 56. | 230. |
| LEFT VERT Z AXIS | -14.23 | 28.17 | -951.83 | 21. | 66. |
| LEFT RESULTANT | 14.59 | 1218.22 | 3.39 | 67. | 430. |
| RIGHT VERT X AXIS | -1.41 | 21.47 | -602.37 | 189. | 64. |
| RIGHT VERT Y AXIS | 1.59 | 17.18 | -184.58 | 156. | 63. |
| RIGHT VERT Z AXIS | -9.86 | 25.02 | -878.73 | 20. | 64. |
| RIGHT RESULTANT | 10.31 | 1080.95 | 7.33 | 64. | 3. |
| ADAM INTERNAL TEMP (DEG C) | 77.52 | 78.62 | 76.62 | 69. | 236. |
| ADAM ACCELERATIONS (G) | | | | | |
| HEAD X AXIS | 0.12 | 130.09 | -116.79 | 188. | 70. |
| HEAD Z AXIS | 0.87 | 32.78 | -107.69 | 42. | 72. |
| CHEST X AXIS | 0.49 | 38.67 | -70.75 | 179. | 52. |
| LUMBAR X AXIS | 0.29 | 13.24 | -98.11 | 49. | 41. |
| ADAM FORCES (LB) | | | | | |
| NECK X AXIS | -8.06 | 1160.53 | -144.51 | 70. | 185. |
| NECK Z AXIS | 10.27 | 796.09 | -225.47 | 72. | 42. |
| LUMBAR X AXIS | 16.26 | 418.70 | -3926.33 | 184. | 71. |
| ADAM NECK MY TORQUE (IN-LB) | -1.84 | 1607.20 | -418.39 | 65. | 55. |

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APPENDIX C

**Data Summaries for
Human Tests.**

Note: Cell D is the X-Band 90 degree Harness

Cell B is the X-Band 45 degree Harness

CREST STUDY -GX TEST: 3088 SUBJ: P-5 WT: 182.0 NOM G: 10.0 CELL: 8

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|--------------------|-----------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 8.98 | -113. 43. 4. | 0. 175. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.48 | -9.81 | 157. | 55. |
| Y AXIS | 0.00 | 0.32 | -0.99 | 174. | 290. |
| Z AXIS | 1.00 | 2.47 | -0.88 | 55. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.11 | 2.15 | -10.56 | 158. | 49. |
| Y AXIS | 0.00 | 1.51 | -1.53 | 173. | 170. |
| Z AXIS | 0.87 | 8.20 | -0.01 | 55. | 163. |
| SLED VELOCITY (FT/S) | 0.00 | 90.45 | 0.00 | 153. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.13 | 2.35 | -13.83 | 171. | 87. |
| Y AXIS EXTERNAL | 0.01 | 4.75 | -2.84 | 75. | 213. |
| Z AXIS EXTERNAL | 0.88 | 15.23 | -2.76 | 77. | 226. |
| RESULTANT | 0.89 | 18.23 | 0.93 | 83. | 163. |
| NORM RESULTANT | 0.09 | 1.84 | 0.03 | 83. | 163. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.13 | 2.02 | -11.38 | 245. | 86. |
| Y AXIS EXTERNAL | 0.01 | 0.52 | -0.81 | 162. | 71. |
| Z AXIS EXTERNAL | 0.85 | 3.45 | -16.89 | 130. | 86. |
| RESULTANT | 0.86 | 20.21 | 0.55 | 86. | 18. |
| NORM RESULTANT | 0.09 | 2.04 | 0.08 | 86. | 18. |
| RY EXTERNAL | -0.86 | 521.09 | -425.75 | 136. | 83. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 9.71 | -11.09 | 175. | 74. |
| Y AXIS EXTERNAL | 0.00 | 1.87 | -2.54 | 174. | 97. |
| Z AXIS EXTERNAL | 0.87 | 18.35 | -5.05 | 66. | 176. |
| RESULTANT | 0.88 | 19.15 | 0.17 | 66. | 238. |
| NORM RESULTANT | 0.08 | 1.89 | 0.02 | 66. | 238. |
| SHOULDER LOADS (LB) | | | | | |
| TENSION | 98.87 | 1009.25 | 44.72 | 82. | 209. |
| LEFT TENSION QRA | 31.98 | 179.72 | 12.98 | 77. | 186. |
| RIGHT TENSION QRA | 29.10 | 182.18 | 27.05 | 75. | 4. |
| LEG LOADS (LB) | | | | | |
| LEFT TENSION QRA | 17.54 | 180.08 | 16.43 | 77. | 6. |
| RIGHT TENSION QRA | 21.84 | 184.14 | 17.15 | 81. | 377. |
| ANCHOR LOADS (LB) | | | | | |
| LEFT 45 DEG X AXIS | 25.93 | 398.92 | 12.12 | 82. | 445. |
| LEFT 45 DEG Y AXIS | 3.00 | 48.94 | 0.23 | 70. | 187. |
| LEFT 45 DEG Z AXIS | 19.79 | 238.80 | 4.59 | 81. | 434. |
| LEFT 45 DEG RESULTANT | 28.35 | 465.20 | 13.24 | 82. | 453. |
| RIGHT 45 DEG X AXIS | 22.95 | 382.57 | 5.85 | 80. | 285. |
| RIGHT 45 DEG Y AXIS | 3.00 | 48.78 | -2.88 | 78. | 285. |
| RIGHT 45 DEG Z AXIS | 22.27 | 258.45 | 9.82 | 78. | 284. |
| RIGHT 45 DEG RESULTANT | 32.15 | 484.09 | 5.44 | 81. | 294. |
| AT VERTICAL X AXIS | 13.91 | 145.51 | 12.54 | 95. | 2. |
| AT VERTICAL Y AXIS | -0.50 | 5.74 | -5.01 | 159. | 58. |
| AT VERTICAL Z AXIS | 74.42 | 390.53 | 47.25 | 97. | 33. |
| AT VERTICAL RESULTANT | 75.72 | 361.18 | 50.22 | 97. | 33. |
| SEAT LOADS (LB) | | | | | |
| LEFT LINK X AXIS | 1.38 | 85.01 | -189.19 | 183. | 81. |
| RIGHT LINK X AXIS | 48.71 | 74.38 | -104.06 | 176. | 82. |
| X AXIS SUM | 48.10 | 138.19 | -293.25 | 176. | 82. |
| X AXIS MINUS TARE | 48.81 | 139.68 | -132.84 | 178. | 83. |
| CENTER LINK Y AXIS | 39.55 | 38.74 | -114.48 | 0. | 88. |
| LEFT Z AXIS | 48.19 | 628.90 | 19.48 | 80. | 430. |
| RIGHT Z AXIS | 31.74 | 615.51 | -5.36 | 78. | 211. |
| CENTER Z AXIS | 222.07 | 1072.84 | 222.21 | 88. | 0. |
| Z AXIS SUM | 299.95 | 2287.86 | 259.66 | 81. | 221. |
| Z AXIS MINUS TARE | 299.77 | 2201.21 | 277.01 | 82. | 215. |
| RESULTANT | 908.34 | 2309.09 | 232.17 | 81. | 221. |
| RESULTANT MINUS TARE | 908.25 | 2207.73 | 267.31 | 82. | 215. |

CREST STUDY -GX TEST: 3089 SUBJ: M21 WT: 129.0 NOM G: 10.0 CELL: 8

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 8.99 | -106. 18. 2. | 2. 44. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.45 | -10.09 | 174. | 56. |
| Y AXIS | 0.00 | 0.25 | -0.22 | 287. | 121. |
| Z AXIS | 1.00 | 2.38 | -0.75 | 56. | 51. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.11 | 1.91 | -10.66 | 155. | 50. |
| Y AXIS | 0.00 | 1.19 | -1.98 | 178. | 188. |
| Z AXIS | 0.87 | 0.21 | -0.22 | 56. | 169. |
| SLED VELOCITY (FT/S) | 0.00 | 30.88 | 0.00 | 155. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.13 | 2.79 | -11.87 | 183. | 97. |
| Y AXIS EXTERNAL | -0.01 | 6.05 | -3.16 | 104. | 118. |
| Z AXIS EXTERNAL | 0.89 | 13.78 | -2.39 | 117. | 108. |
| RESULTANT | 0.90 | 16.52 | 0.13 | 89. | 213. |
| NORM RESULTANT | 0.09 | 1.64 | 0.01 | 89. | 213. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.13 | 1.48 | -11.80 | 212. | 78. |
| Y AXIS EXTERNAL | 0.01 | 0.46 | -1.68 | 310. | 76. |
| Z AXIS EXTERNAL | 0.88 | 3.90 | -18.21 | 143. | 77. |
| RESULTANT | 0.87 | 21.77 | 0.80 | 77. | 20. |
| NORM RESULTANT | 0.09 | 2.16 | 0.08 | 77. | 20. |
| RY EXTERNAL | -0.68 | 1070.46 | -810.70 | 118. | 74. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.11 | 2.53 | -13.01 | 182. | 80. |
| Y AXIS EXTERNAL | 0.00 | 1.68 | -2.48 | 63. | 79. |
| Z AXIS EXTERNAL | 0.87 | 18.10 | -2.66 | 67. | 31. |
| RESULTANT | 0.88 | 20.01 | 0.55 | 67. | 400. |
| NORM RESULTANT | 0.09 | 1.98 | 0.05 | 67. | 400. |
| SHOULDER LOADS (LB) | | | | | |
| TENSION | 87.87 | 720.89 | 88.31 | 83. | 0. |
| LEFT TENSION QRA | 35.09 | 125.11 | 18.72 | 76. | 250. |
| RIGHT TENSION QRA | 40.97 | 153.98 | 27.92 | 76. | 183. |
| LEG LOADS (LB) | | | | | |
| LEFT TENSION QRA | 20.10 | 198.37 | 13.42 | 76. | 176. |
| RIGHT TENSION QRA | 26.67 | 118.19 | 22.62 | 77. | 165. |
| ANCHOR LOADS (LB) | | | | | |
| LEFT 45 DEG X AXIS | 30.04 | 380.94 | 21.29 | 78. | 185. |
| LEFT 45 DEG Y AXIS | 10.11 | 74.53 | 4.94 | 80. | 176. |
| LEFT 45 DEG Z AXIS | 15.28 | 206.55 | 2.02 | 79. | 186. |
| LEFT 45 DEG RESULTANT | 35.22 | 404.37 | 23.06 | 80. | 187. |
| RIGHT 45 DEG X AXIS | 28.30 | 330.83 | 23.39 | 83. | 275. |
| RIGHT 45 DEG Y AXIS | 7.52 | 78.71 | 4.21 | 84. | 172. |
| RIGHT 45 DEG Z AXIS | 31.16 | 266.87 | 24.57 | 84. | 269. |
| RIGHT 45 DEG RESULTANT | 41.49 | 490.55 | 34.37 | 84. | 282. |
| RT VERTICAL X AXIS | -5.67 | 14.45 | -7.71 | 49. | 0. |
| RT VERTICAL Y AXIS | 10.85 | 12.80 | 5.27 | 53. | 185. |
| RT VERTICAL Z AXIS | 57.09 | 152.58 | 28.84 | 95. | 37. |
| RT VERTICAL RESULTANT | 58.40 | 153.20 | 30.88 | 95. | 42. |
| SEAT LOADS (LB) | | | | | |
| LEFT LINK X AXIS | 21.05 | 21.47 | -172.49 | 0. | 81. |
| RIGHT LINK X AXIS | 1.83 | 1.49 | -126.80 | 1. | 84. |
| X AXIS SUM | 22.88 | 21.79 | -298.13 | 0. | 82. |
| X AXIS MINUS TARE | 23.07 | 58.70 | -193.45 | 26. | 79. |
| CENTER LINK Y AXIS | -43.62 | -2.50 | -192.62 | 223. | 79. |
| LEFT Z AXIS | 46.65 | 418.70 | 8.99 | 78. | 186. |
| RIGHT Z AXIS | 31.87 | 335.12 | 7.94 | 81. | 317. |
| CENTER Z AXIS | 140.20 | 854.38 | 149.20 | 81. | 0. |
| Z AXIS SUM | 225.72 | 1649.98 | 227.50 | 81. | 0. |
| Z AXIS MINUS TARE | 225.61 | 1548.44 | 228.28 | 81. | 0. |
| RESULTANT | 230.87 | 1887.11 | 232.58 | 81. | 0. |
| RESULTANT MINUS TARE | 230.90 | 1565.49 | 231.65 | 81. | 0. |

CREST STUDY -GX TEST: 3117 SUBJ: B-1 WT: 170.0 NORM GR: 10.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|------------------------|------------------|------------------|---------------------|--------------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 9.99 | -155. 181. 7. | 3. 26. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.52 | -10.00 | 158. | 56. |
| Y AXIS | 0.00 | 0.30 | -0.22 | 317. | 58. |
| Z AXIS | 1.00 | 2.57 | -0.65 | 55. | 51. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.12 | 2.47 | -10.54 | 160. | 49. |
| Y AXIS | 0.00 | 1.32 | -1.84 | 182. | 174. |
| Z AXIS | 0.87 | 8.10 | -1.06 | 55. | 167. |
| SLED VELOCITY (FT/S) | 0.00 | 30.57 | 0.00 | 156. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.09 | 2.77 | -15.00 | 174. | 73. |
| Y AXIS EXTERNAL | 0.00 | 7.94 | -3.13 | 36. | 174. |
| Z AXIS EXTERNAL | 0.89 | 12.86 | -9.36 | 91. | 169. |
| RESULTANT | 0.89 | 16.11 | 0.31 | 73. | 205. |
| NORM RESULTANT | 0.09 | 1.61 | 0.03 | 73. | 205. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.25 | 1.81 | -8.41 | 245. | 95. |
| Y AXIS EXTERNAL | -0.01 | 0.70 | -1.33 | 159. | 199. |
| Z AXIS EXTERNAL | 0.99 | 4.49 | -9.77 | 178. | 76. |
| RESULTANT | 1.02 | 12.46 | 0.12 | 90. | 17. |
| NORM RESULTANT | 0.10 | 1.25 | 0.01 | 90. | 17. |
| RY EXTERNAL | 4.48 | 400.62 | -266.00 | 117. | 220. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.01 | 9.57 | -11.90 | 184. | 82. |
| Y AXIS EXTERNAL | -0.02 | 1.56 | -1.28 | 210. | 85. |
| Z AXIS EXTERNAL | 0.00 | 11.17 | -1.11 | 52. | 166. |
| RESULTANT | 0.05 | 13.44 | 0.04 | 85. | 383. |
| NORM RESULTANT | 0.00 | 1.34 | 0.00 | 85. | 383. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.11 | 8.28 | -13.10 | 182. | 89. |
| Y AXIS EXTERNAL | 0.01 | 5.37 | -7.20 | 70. | 177. |
| Z AXIS EXTERNAL | 0.87 | 12.81 | -14.42 | 70. | 177. |
| RESULTANT | 0.88 | 17.27 | 0.15 | 70. | 225. |
| NORM RESULTANT | 0.09 | 1.73 | 0.02 | 70. | 225. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 179.82 | 793.29 | 69.40 | 86. | 180. |
| LEFT TENSION QRA | 80.20 | 225.88 | 32.01 | 84. | 167. |
| RIGHT TENSION QRA | 54.97 | 222.03 | 28.12 | 86. | 179. |
| LEG LOADS (LBS) | | | | | |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT 45 DEG X AXIS | 40.46 | 436.37 | 12.08 | 84. | 401. |
| LEFT 45 DEG Y AXIS | 2.71 | 37.46 | -0.81 | 85. | 188. |
| LEFT 45 DEG Z AXIS | 25.43 | 280.78 | 0.41 | 84. | 424. |
| LEFT 45 DEG RESULTANT | 47.88 | 520.25 | 12.38 | 85. | 425. |
| RIGHT 45 DEG X AXIS | 40.54 | 439.55 | 25.81 | 85. | 423. |
| RIGHT 45 DEG Y AXIS | 4.65 | 65.56 | -1.23 | 90. | 171. |
| RIGHT 45 DEG Z AXIS | 45.34 | 557.76 | 22.47 | 66. | 450. |
| RIGHT 45 DEG RESULTANT | 61.01 | 568.85 | 34.32 | 85. | 450. |
| RT VERTICAL X AXIS | -18.85 | 37.50 | -20.12 | 105. | 0. |
| RT VERTICAL Y AXIS | 2.01 | 2.22 | -8.31 | 0. | 57. |
| RT VERTICAL Z AXIS | 66.16 | 145.38 | 33.25 | 114. | 46. |
| RT VERTICAL RESULTANT | 60.20 | 150.17 | 33.52 | 115. | 46. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 23.25 | 89.59 | -130.40 | 181. | 79. |
| RIGHT LINK X AXIS | 5.97 | 35.46 | -158.99 | 448. | 82. |
| X AXIS SUM | 27.21 | 93.22 | -207.39 | 180. | 82. |
| X AXIS MINUS TARE | 27.40 | 84.95 | -139.57 | 421. | 87. |
| CENTER LINK Y AXIS | -50.35 | 8.84 | -189.39 | 343. | 88. |
| LEFT Z AXIS | 53.08 | 521.40 | -5.67 | 82. | 295. |
| RIGHT Z AXIS | 49.32 | 529.77 | 94.31 | 80. | 201. |
| CENTER Z AXIS | 267.40 | 1009.44 | 254.70 | 89. | 0. |
| Z AXIS SUM | 938.80 | 2048.21 | 288.07 | 66. | 203. |
| Z AXIS MINUS TARE | 938.75 | 1954.17 | 298.47 | 66. | 205. |
| RESULTANT | 944.53 | 2074.08 | 292.89 | 66. | 203. |
| RESULTANT MINUS TARE | 944.55 | 1966.41 | 304.59 | 66. | 205. |

CREST STUDY -GX TEST: 5118 SUBJ: 0-5 WT: 175.0 NORM G: 10.0 CELL: 8

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|------------------------|------------------|------------------|---------------------|--------------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 9.99 | -153. 199. 2. | 0. 72. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.52 | -10.05 | 157. | 56. |
| Y AXIS | 0.00 | 0.98 | -0.42 | 259. | 122. |
| Z AXIS | 1.00 | 2.44 | -0.61 | 55. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.12 | 2.65 | -10.60 | 158. | 49. |
| Y AXIS | 0.00 | 1.23 | -1.23 | 224. | 171. |
| Z AXIS | 0.88 | 8.02 | -0.70 | 55. | 164. |
| SLED VELOCITY (FT/S) | 0.00 | 30.51 | 0.00 | 154. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.14 | 2.49 | -21.85 | 179. | 84. |
| Y AXIS EXTERNAL | -0.01 | 0.79 | -2.94 | 95. | 172. |
| Z AXIS EXTERNAL | 0.87 | 14.92 | -4.20 | 101. | 169. |
| RESULTANT | 0.88 | 22.26 | 0.20 | 84. | 224. |
| NORM RESULTANT | 0.08 | 2.21 | 0.02 | 84. | 224. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.15 | 2.71 | -13.55 | 212. | 101. |
| Y AXIS EXTERNAL | -0.02 | 0.64 | -0.73 | 229. | 114. |
| Z AXIS EXTERNAL | 0.84 | 4.17 | -18.33 | 116. | 87. |
| RESULTANT | 0.85 | 19.85 | 0.34 | 90. | 21. |
| NORM RESULTANT | 0.08 | 1.96 | 0.03 | 90. | 21. |
| AT EXTERNAL | -2.05 | 735.71 | -302.58 | 118. | 237. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.01 | 1.56 | -18.21 | 165. | 63. |
| Y AXIS EXTERNAL | 0.01 | 2.29 | -1.25 | 268. | 278. |
| Z AXIS EXTERNAL | 0.01 | 5.33 | -2.18 | 46. | 125. |
| RESULTANT | 0.03 | 16.32 | 0.03 | 83. | 0. |
| NORM RESULTANT | 0.00 | 1.62 | 0.00 | 83. | 0. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 2.23 | -13.21 | 198. | 85. |
| Y AXIS EXTERNAL | 0.00 | 1.08 | -1.08 | 68. | 137. |
| Z AXIS EXTERNAL | 0.88 | 16.41 | -2.26 | 86. | 182. |
| RESULTANT | 0.49 | 20.83 | 0.17 | 94. | 132. |
| NORM RESULTANT | 0.09 | 2.05 | 0.02 | 94. | 132. |
| SHOULDER LOADS (LB) | | | | | |
| TENSION | 145.44 | 944.23 | 51.73 | 88. | 195. |
| LEFT TENSION GRR | 35.47 | 204.79 | 20.38 | 89. | 179. |
| RIGHT TENSION GRR | 28.54 | 171.56 | 16.43 | 86. | 298. |
| LEG LOADS (LB) | | | | | |
| ANCHOR LOADS (LB) | | | | | |
| LEFT 45 DEG X AXIS | 22.10 | 869.48 | 22.10 | 92. | 0. |
| LEFT 45 DEG Y AXIS | 2.10 | 92.78 | -1.18 | 93. | 209. |
| LEFT 45 DEG Z AXIS | 13.40 | 360.66 | 10.56 | 90. | 431. |
| LEFT 45 DEG RESULTANT | 25.98 | 770.39 | 24.57 | 92. | 443. |
| RIGHT 45 DEG X AXIS | 18.83 | 651.22 | 18.31 | 91. | 212. |
| RIGHT 45 DEG Y AXIS | 2.05 | 109.35 | -1.10 | 89. | 212. |
| RIGHT 45 DEG Z AXIS | 20.78 | 454.14 | 18.50 | 91. | 0. |
| RIGHT 45 DEG RESULTANT | 28.06 | 801.25 | 27.65 | 91. | 0. |
| AT VERTICAL X AXIS | -16.38 | 116.21 | -16.98 | 92. | 2. |
| AT VERTICAL Y AXIS | 0.75 | 4.93 | -5.89 | 92. | 55. |
| AT VERTICAL Z AXIS | 72.02 | 281.48 | 31.32 | 91. | 43. |
| AT VERTICAL RESULTANT | 73.87 | 287.00 | 31.78 | 92. | 43. |
| SEAT LOADS (LB) | | | | | |
| LEFT LINK X AXIS | 10.85 | 87.88 | -183.77 | 159. | 92. |
| RIGHT LINK X AXIS | 30.51 | 99.18 | -199.91 | 194. | 92. |
| X AXIS SUM | 41.36 | 157.32 | -339.68 | 177. | 92. |
| X AXIS MINUS TARE | 41.70 | 151.97 | -186.04 | 185. | 92. |
| CENTER LINK Y AXIS | 64.96 | 65.18 | -108.68 | 0. | 93. |
| LEFT Z AXIS | 40.88 | 808.29 | 19.02 | 93. | 301. |
| RIGHT Z AXIS | 37.37 | 810.58 | 20.93 | 95. | 223. |
| CENTER Z AXIS | 71.19 | 1104.20 | 173.97 | 94. | 0. |
| Z AXIS SUM | 249.25 | 2809.98 | 252.46 | 94. | 0. |
| Z AXIS MINUS TARE | 249.08 | 2725.88 | 250.03 | 95. | 1. |
| RESULTANT | 280.87 | 2831.37 | 285.48 | 94. | 1. |
| RESULTANT MINUS TARE | 260.75 | 2734.02 | 281.98 | 95. | 1. |

CREST STUDY -GX TEST: 3131 SUBJ: K-2 WT: 187.0 NCM G: 10.0 CELL: 8

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|---------------------|-----------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 9.99 | -179. 49. 36. | 0. 38. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.49 | -9.87 | 160. | 58. |
| Y AXIS | 0.00 | 0.29 | -0.30 | 279. | 128. |
| Z AXIS | 1.00 | 2.49 | -0.69 | 57. | 52. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.13 | 2.06 | -10.46 | 181. | 51. |
| Y AXIS | 0.00 | 1.28 | -1.47 | 182. | 173. |
| Z AXIS | 0.87 | 8.18 | -0.35 | 57. | 203. |
| SLED VELOCITY (FT/S) | 0.00 | 30.11 | 0.00 | 156. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.09 | 2.01 | -11.29 | 168. | 79. |
| Y AXIS EXTERNAL | 0.03 | 3.41 | -1.39 | 92. | 160. |
| Z AXIS EXTERNAL | 0.98 | 11.02 | -1.95 | 102. | 209. |
| RESULTANT | 0.89 | 13.82 | 0.20 | 79. | 174. |
| NORM RESULTANT | 0.09 | 1.40 | 0.02 | 79. | 174. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.03 | 2.20 | -8.57 | 233. | 101. |
| Y AXIS EXTERNAL | 0.06 | 0.44 | -1.06 | 145. | 86. |
| Z AXIS EXTERNAL | 0.81 | 3.84 | -13.38 | 180. | 92. |
| RESULTANT | 0.81 | 15.47 | 0.41 | 95. | 200. |
| NORM RESULTANT | 0.08 | 1.57 | 0.04 | 95. | 200. |
| AT EXTERNAL | -5.38 | 303.72 | -187.36 | 126. | 97. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.01 | 1.55 | -13.98 | 184. | 89. |
| Y AXIS EXTERNAL | 0.00 | 1.74 | -2.43 | 191. | 97. |
| Z AXIS EXTERNAL | 0.00 | 3.80 | -2.66 | 53. | 118. |
| RESULTANT | 0.03 | 14.09 | 0.04 | 89. | 0. |
| NORM RESULTANT | 0.00 | 1.43 | 0.00 | 89. | 0. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 1.78 | -12.52 | 184. | 82. |
| Y AXIS EXTERNAL | 0.00 | 7.28 | -1.50 | 88. | 187. |
| Z AXIS EXTERNAL | 0.67 | 9.32 | -0.44 | 87. | 38. |
| RESULTANT | 0.68 | 16.41 | 0.28 | 84. | 245. |
| NORM RESULTANT | 0.09 | 1.66 | 0.03 | 84. | 245. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 125.48 | 775.38 | 45.72 | 60. | 212. |
| LEFT TENSION GMA | 39.28 | 173.58 | 15.18 | 61. | 174. |
| RIGHT TENSION GMA | 42.22 | 202.01 | 32.34 | 64. | 184. |
| TENSION (LBS) | | | | | |
| LEFT TENSION GMA | 23.88 | 189.08 | 19.90 | 83. | 188. |
| RIGHT TENSION GMA | 21.53 | 180.88 | 18.57 | 85. | 180. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT 45 DEG X AXIS | 42.88 | 581.53 | 34.81 | 88. | 419. |
| LEFT 45 DEG Y AXIS | 5.05 | 84.18 | -1.95 | 88. | 211. |
| LEFT 45 DEG Z AXIS | 28.08 | 359.29 | 18.17 | 85. | 209. |
| LEFT 45 DEG RESULTANT | 50.68 | 669.72 | 39.68 | 86. | 429. |
| RIGHT 45 DEG X AXIS | 37.92 | 528.19 | 20.20 | 87. | 414. |
| RIGHT 45 DEG Y AXIS | 4.32 | 77.88 | -0.67 | 84. | 216. |
| RIGHT 45 DEG Z AXIS | 44.22 | 392.22 | 20.21 | 86. | 430. |
| RIGHT 45 DEG RESULTANT | 58.44 | 859.82 | 28.70 | 87. | 430. |
| AT VERTICAL X AXIS | -8.33 | 93.57 | -0.16 | 103. | 1. |
| AT VERTICAL Y AXIS | 8.88 | 10.08 | -0.67 | 98. | 58. |
| AT VERTICAL Z AXIS | 75.79 | 127.05 | 17.98 | 114. | 46. |
| AT VERTICAL RESULTANT | 78.22 | 210.23 | 22.80 | 114. | 46. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 36.29 | 63.01 | -171.91 | 298. | 84. |
| RIGHT LINK X AXIS | 5.81 | 72.08 | -151.65 | 425. | 90. |
| X AXIS SUM | 42.14 | 129.10 | -321.36 | 412. | 90. |
| X AXIS MINUS TARE | 42.18 | 124.90 | -183.81 | 420. | 90. |
| CENTER LINK Y AXIS | -87.23 | -18.01 | -217.39 | 227. | 90. |
| LEFT Z AXIS | 43.68 | 735.18 | 11.22 | 80. | 274. |
| RIGHT Z AXIS | 75.21 | 709.90 | 5.42 | 91. | 41. |
| CENTER Z AXIS | 252.38 | 1069.37 | 252.87 | 93. | 1. |
| Z AXIS SUM | 371.28 | 2308.71 | 303.58 | 92. | 237. |
| Z AXIS MINUS TARE | 371.14 | 2414.03 | 314.20 | 92. | 239. |
| RESULTANT | 303.08 | 2938.20 | 314.95 | 92. | 237. |
| RESULTANT MINUS TARE | 303.58 | 2430.18 | 324.57 | 92. | 239. |

CREST STUDY -GX TEST: 3132 SUBJ: M20 WT: 192.0 NOM G: 10.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|--------------------|-----------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.49 9.98 | -186. 21. 5. | 85. 85. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.52 | -9.89 | 159. | 57. |
| Y AXIS | 0.00 | 0.38 | -0.38 | 266. | 324. |
| Z AXIS | 1.00 | 2.45 | -0.73 | 55. | 51. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.12 | 2.21 | -10.41 | 160. | 50. |
| Y AXIS | 0.00 | 1.22 | -1.37 | 181. | 173. |
| Z AXIS | 0.87 | 8.08 | -0.41 | 56. | 167. |
| SLED VELOCITY (FT/S) | 0.00 | 29.95 | 0.00 | 162. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 4.12 | -13.54 | 188. | 104. |
| Y AXIS EXTERNAL | 0.30 | 5.60 | -2.42 | 95. | 156. |
| Z AXIS EXTERNAL | 0.88 | 10.29 | -2.44 | 85. | 158. |
| RESULTANT | 0.89 | 17.46 | 0.07 | 95. | 215. |
| NORM RESULTANT | 0.09 | 1.77 | 0.01 | 95. | 215. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.19 | 2.58 | -12.75 | 261. | 104. |
| Y AXIS EXTERNAL | -0.02 | 0.90 | -1.20 | 245. | 191. |
| Z AXIS EXTERNAL | 0.89 | 4.73 | -14.93 | 177. | 94. |
| RESULTANT | 0.91 | 16.88 | 0.41 | 98. | 25. |
| NORM RESULTANT | 0.09 | 1.69 | 0.04 | 98. | 25. |
| AT EXTERNAL | -0.12 | 642.79 | -430.83 | 127. | 232. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.01 | 2.61 | -14.08 | 186. | 91. |
| Y AXIS EXTERNAL | -0.01 | 1.68 | -2.08 | 183. | 98. |
| Z AXIS EXTERNAL | 0.00 | 4.75 | -1.41 | 49. | 88. |
| RESULTANT | 0.05 | 14.21 | 0.03 | 91. | 1. |
| NORM RESULTANT | 0.00 | 1.44 | 0.00 | 91. | 1. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.11 | 6.42 | -13.32 | 184. | 77. |
| Y AXIS EXTERNAL | 0.00 | 3.10 | -1.48 | 58. | 216. |
| Z AXIS EXTERNAL | 0.86 | 14.61 | -6.05 | 59. | 182. |
| RESULTANT | 0.87 | 16.67 | 0.40 | 76. | 206. |
| NORM RESULTANT | 0.08 | 1.69 | 0.04 | 76. | 206. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 58.87 | 998.60 | 52.86 | 89. | 0. |
| LEFT TENSION QRA | 38.64 | 231.41 | 28.09 | 87. | 379. |
| RIGHT TENSION QRA | 33.98 | 269.00 | 33.89 | 86. | 0. |
| LEG LOADS (LBS) | | | | | |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT 45 DEG X AXIS | 38.81 | 619.38 | 37.14 | 86. | 0. |
| LEFT 45 DEG Y AXIS | 0.87 | 40.11 | -3.87 | 86. | 186. |
| LEFT 45 DEG Z AXIS | 23.59 | 385.72 | 22.81 | 86. | 3. |
| LEFT 45 DEG RESULTANT | 43.83 | 725.70 | 44.73 | 86. | 0. |
| RIGHT 45 DEG X AXIS | 28.55 | 584.89 | 27.57 | 86. | 0. |
| RIGHT 45 DEG Y AXIS | 3.84 | 40.93 | -0.26 | 84. | 176. |
| RIGHT 45 DEG Z AXIS | 28.95 | 497.01 | 28.29 | 86. | 1. |
| RIGHT 45 DEG RESULTANT | 39.49 | 734.15 | 39.67 | 89. | 1. |
| AT VERTICAL X AXIS | -1.20 | 135.10 | -2.30 | 90. | 3. |
| AT VERTICAL Y AXIS | 9.65 | 10.99 | -0.90 | 85. | 56. |
| AT VERTICAL Z AXIS | 48.17 | 285.44 | 8.10 | 91. | 40. |
| AT VERTICAL RESULTANT | 48.34 | 315.98 | 14.03 | 92. | 35. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 30.08 | 110.04 | -158.61 | 182. | 83. |
| RIGHT LINK X AXIS | -2.61 | 72.22 | -157.54 | 349. | 92. |
| X AXIS SUM | 27.46 | 149.77 | -310.17 | 337. | 90. |
| X AXIS MINUS TARE | 27.75 | 145.80 | -171.01 | 340. | 89. |
| CENTER LINK Y AXIS | -60.09 | -16.29 | -243.93 | 227. | 81. |
| LEFT Z AXIS | 19.73 | 735.77 | 8.71 | 86. | 193. |
| RIGHT Z AXIS | 16.64 | 726.28 | 24.90 | 91. | 350. |
| CENTER Z AXIS | 181.06 | 1224.39 | 185.20 | 80. | 0. |
| Z AXIS SUM | 301.94 | 2680.24 | 304.02 | 90. | 0. |
| Z AXIS MINUS TARE | 301.26 | 2588.79 | 302.61 | 91. | 0. |
| RESULTANT | 308.48 | 2708.79 | 911.18 | 90. | 0. |
| RESULTANT MINUS TARE | 308.44 | 2604.95 | 310.14 | 91. | 0. |

CREST STUDY -GX TEST: 9133 SUBJ: M16 WT: 188.0 NOM G: 10.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|--------------------|-----------------|
| REFERENCE MARK 2.5V EXT PHR 10V EXT PHR | | 2.50 10.01 | 2.50 9.99 | -160. 25. 3. | 2. 6. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.44 | -0.82 | 159. | 57. |
| Y AXIS | 0.00 | 0.20 | -0.30 | 274. | 125. |
| Z AXIS | 1.00 | 2.52 | -0.66 | 56. | 51. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.13 | 2.95 | -10.49 | 159. | 50. |
| Y AXIS | 0.00 | 1.14 | -1.25 | 225. | 172. |
| Z AXIS | 0.87 | 8.18 | -0.31 | 56. | 202. |
| SLED VELOCITY (FT/S) | 0.00 | 29.98 | 0.00 | 162. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.14 | 9.12 | -10.05 | 169. | 98. |
| Y AXIS EXTERNAL | -0.01 | 5.32 | -4.34 | 98. | 195. |
| Z AXIS EXTERNAL | 0.86 | 18.20 | -8.86 | 107. | 187. |
| RESULTANT | 0.87 | 18.95 | 0.24 | 107. | 234. |
| NORM RESULTANT | 0.09 | 1.91 | 0.02 | 107. | 234. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.09 | 3.04 | -9.73 | 271. | 90. |
| Y AXIS EXTERNAL | 0.01 | 0.52 | -0.59 | 81. | 131. |
| Z AXIS EXTERNAL | 0.37 | 2.95 | -10.07 | 139. | 89. |
| RESULTANT | 0.87 | 20.53 | 0.08 | 91. | 198. |
| NORM RESULTANT | 0.09 | 2.07 | 0.01 | 91. | 198. |
| AT EXTERNAL | 0.13 | 596.10 | -445.05 | 128. | 85. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.01 | 1.78 | -10.45 | 205. | 85. |
| Y AXIS EXTERNAL | 0.01 | 1.18 | -2.29 | 210. | 49. |
| Z AXIS EXTERNAL | 0.00 | 4.88 | -9.62 | 55. | 100. |
| RESULTANT | 0.04 | 14.55 | 0.03 | 85. | 0. |
| NORM RESULTANT | 0.00 | 1.47 | 0.00 | 85. | 0. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.13 | 6.72 | -14.22 | 181. | 79. |
| Y AXIS EXTERNAL | 0.01 | 7.81 | -4.95 | 72. | 170. |
| Z AXIS EXTERNAL | 0.81 | 13.35 | -2.49 | 74. | 174. |
| RESULTANT | 0.89 | 19.04 | 0.47 | 76. | 314. |
| NORM RESULTANT | 0.09 | 1.92 | 0.05 | 76. | 314. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 68.13 | 895.76 | 43.97 | 94. | 234. |
| LEFT TENSION OAR | 35.46 | 107.98 | -3.55 | 85. | 21. |
| RIGHT TENSION OAR | 39.92 | 294.88 | 35.63 | 83. | 181. |
| LEG LOADS (LBS) | | | | | |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT 45 DEG X AXIS | 40.08 | 599.50 | 27.19 | 85. | 333. |
| LEFT 45 DEG Y AXIS | 1.85 | 33.05 | -2.00 | 86. | 186. |
| LEFT 45 DEG Z AXIS | 28.91 | 368.03 | 12.82 | 85. | 936. |
| LEFT 45 DEG RESULTANT | 50.09 | 704.70 | 31.12 | 85. | 333. |
| RIGHT 45 DEG X AXIS | 34.78 | 557.53 | 20.89 | 85. | 196. |
| RIGHT 45 DEG Y AXIS | 1.92 | 42.28 | -5.24 | 85. | 175. |
| RIGHT 45 DEG Z AXIS | 38.79 | 903.64 | 16.74 | 85. | 195. |
| RIGHT 45 DEG RESULTANT | 50.86 | 683.80 | 28.39 | 85. | 198. |
| AT VERTICAL X AXIS | 2.14 | 117.81 | 0.35 | 112. | 3. |
| AT VERTICAL Y AXIS | 2.43 | 7.28 | -2.38 | 85. | 57. |
| AT VERTICAL Z AXIS | 34.51 | 225.48 | -0.75 | 113. | 37. |
| AT VERTICAL RESULTANT | 34.69 | 253.46 | 10.73 | 114. | 32. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 19.46 | 97.90 | -190.00 | 385. | 63. |
| RIGHT LINK X AXIS | 15.06 | 48.66 | -141.45 | 195. | 84. |
| X AXIS SUM | 28.52 | 101.21 | -931.18 | 179. | 83. |
| X AXIS MINUS TARE | 28.57 | 96.94 | -180.27 | 180. | 88. |
| CENTER LINK Y AXIS | -58.79 | -14.25 | -236.89 | 336. | 79. |
| LEFT Z AXIS | 54.20 | 704.70 | 11.75 | 83. | 345. |
| RIGHT Z AXIS | 65.79 | 847.59 | 9.69 | 84. | 203. |
| CENTER Z AXIS | 158.51 | 1105.82 | 162.31 | 88. | 0. |
| Z AXIS SUM | 278.50 | 2447.09 | 259.58 | 83. | 203. |
| Z AXIS MINUS TARE | 278.42 | 2364.54 | 265.29 | 84. | 204. |
| RESULTANT | 288.06 | 2480.55 | 289.05 | 83. | 203. |
| RESULTANT MINUS TARE | 285.99 | 2382.12 | 278.82 | 84. | 204. |

CREST STUDY -GX TEST: 9134 SUBJ: R-6 WT: 170.0 NOM G: 10.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-------------------------|---------------------|---------------|---------------|-----------------|-----------------|
| REFERENCE MARK | | 2.50 | 2.50 | -177. | 0. |
| 2.5V EXT PWR | | 10.01 | 8.99 | 3. | 24. |
| 10V EXT PWR | | | | | 23. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.47 | -0.98 | 176. | 57. |
| Y AXIS | 0.00 | 0.28 | -0.97 | 146. | 113. |
| Z AXIS | 1.00 | 2.46 | -0.58 | 56. | 51. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.13 | 2.41 | -10.58 | 158. | 50. |
| Y AXIS | 0.00 | 1.42 | -1.49 | 259. | 252. |
| Z AXIS | 0.87 | 7.91 | -0.60 | 56. | 163. |
| SLED VELOCITY (FT/S) | 0.00 | 30.14 | 0.00 | 158. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.13 | 2.97 | -17.10 | 163. | 87. |
| Y AXIS EXTERNAL | -0.01 | 4.73 | -2.05 | 87. | 132. |
| Z AXIS EXTERNAL | 0.87 | 6.29 | -1.99 | 112. | 225. |
| RESULTANT | 0.88 | 19.02 | 0.22 | 87. | 212. |
| NORM RESULTANT | 0.09 | 1.81 | 0.02 | 87. | 212. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.15 | 1.68 | -0.27 | 269. | 105. |
| Y AXIS EXTERNAL | 0.01 | 0.68 | -1.18 | 91. | 151. |
| Z AXIS EXTERNAL | 0.91 | 4.40 | -18.27 | 176. | 90. |
| RESULTANT | 0.92 | 19.30 | 0.78 | 92. | 222. |
| NORM RESULTANT | 0.09 | 1.94 | 0.08 | 92. | 222. |
| AY EXTERNAL | 2.30 | 460.86 | -471.24 | 153. | 102. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.01 | 1.98 | -15.34 | 193. | 85. |
| Y AXIS EXTERNAL | 0.00 | 1.32 | -2.83 | 243. | 81. |
| Z AXIS EXTERNAL | 0.00 | 4.38 | -2.96 | 46. | 78. |
| RESULTANT | 0.04 | 15.54 | 0.06 | 84. | 429. |
| NORM RESULTANT | 0.00 | 1.58 | 0.01 | 84. | 429. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 1.30 | -11.38 | 165. | 80. |
| Y AXIS EXTERNAL | 0.00 | 9.38 | -2.05 | 97. | 23. |
| Z AXIS EXTERNAL | 0.87 | 17.12 | -0.65 | 95. | 178. |
| RESULTANT | 0.88 | 21.73 | 0.21 | 95. | 260. |
| NORM RESULTANT | 0.09 | 2.18 | 0.02 | 95. | 260. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 75.77 | 841.08 | 20.60 | 87. | 233. |
| LEFT TENSION QRA | 38.05 | 220.91 | 19.95 | 80. | 182. |
| RIGHT TENSION QRA | 32.20 | 194.78 | 25.11 | 80. | 176. |
| LEG LOADS (LBS) | | | | | |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT 45 DEG X AXIS | 19.29 | 638.60 | 20.88 | 88. | 0. |
| LEFT 45 DEG Y AXIS | 2.14 | 87.27 | -2.32 | 87. | 241. |
| LEFT 45 DEG Z AXIS | 8.51 | 363.85 | 7.45 | 87. | 0. |
| LEFT 45 DEG RESULTANT | 21.22 | 736.12 | 22.29 | 88. | 0. |
| RIGHT 45 DEG X AXIS | 20.14 | 597.35 | 21.79 | 88. | 0. |
| RIGHT 45 DEG Y AXIS | 3.97 | 101.88 | 0.41 | 86. | 214. |
| RIGHT 45 DEG Z AXIS | 24.58 | 415.88 | 24.38 | 87. | 0. |
| RIGHT 45 DEG RESULTANT | 32.03 | 733.34 | 32.98 | 87. | 0. |
| AT VERTICAL X AXIS | -1.91 | 197.54 | -2.08 | 109. | 1. |
| AT VERTICAL Y AXIS | 1.73 | 10.00 | -2.90 | 87. | 57. |
| AT VERTICAL Z AXIS | 52.84 | 285.22 | 5.55 | 102. | 46. |
| AT VERTICAL RESULTANT | 52.91 | 287.88 | 12.52 | 102. | 46. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 25.88 | 82.40 | -179.00 | 159. | 91. |
| RIGHT LINK X AXIS | 24.60 | 47.47 | -174.13 | 195. | 90. |
| X AXIS SUM | 49.29 | 113.35 | -345.96 | 177. | 91. |
| X AXIS MINUS TARE | 49.42 | 108.57 | -206.05 | 49. | 90. |
| CENTER LINK Y AXIS | -48.85 | 6.38 | -216.28 | 224. | 91. |
| LEFT Z AXIS | 20.08 | 734.03 | 0.78 | 91. | 250. |
| RIGHT Z AXIS | 50.92 | 805.18 | 27.93 | 91. | 224. |
| CENTER Z AXIS | 172.82 | 1156.10 | 172.90 | 93. | 235. |
| Z AXIS SUM | 249.83 | 2689.12 | 205.93 | 92. | 233. |
| Z AXIS MINUS TARE | 249.76 | 2598.25 | 214.54 | 92. | 237. |
| RESULTANT | 259.51 | 2719.74 | 215.43 | 92. | 234. |
| RESULTANT MINUS TARE | 259.47 | 2615.01 | 223.01 | 92. | 237. |

CREST STUDY -GX TEST: 3071 SUBJ: L-3 WT: 185.0 NOM G: 10.0 CELL: B

| DATA ID | IMMEDIATE PRE IMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|-------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 9.99 | 83. 3. 9. | 22. 7. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.50 | -9.85 | 157. | 56. |
| Y AXIS | 0.00 | 0.41 | -0.34 | 242. | 122. |
| Z AXIS | 1.00 | 2.35 | -0.59 | 56. | 51. |
| SERT ACCELERATION (G) | | | | | |
| X AXIS | 0.11 | 2.71 | -10.35 | 156. | 49. |
| Y AXIS | 0.00 | 1.59 | -1.55 | 176. | 171. |
| Z AXIS | 0.08 | 7.94 | -0.50 | 56. | 164. |
| SLED VELOCITY (FT/S) | 0.00 | 30.54 | 0.00 | 156. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.11 | 6.87 | -15.05 | 191. | 79. |
| Y AXIS EXTERNAL | 0.01 | 6.31 | -7.98 | 103. | 126. |
| Z AXIS EXTERNAL | 0.08 | 11.72 | -2.24 | 133. | 170. |
| RESULTANT | 0.09 | 16.77 | 0.38 | 78. | 258. |
| NORM RESULTANT | 0.09 | 1.70 | 0.04 | 78. | 258. |
| HERO ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 1.52 | -11.40 | 278. | 103. |
| Y AXIS EXTERNAL | 0.00 | 0.80 | -0.74 | 105. | 190. |
| Z AXIS EXTERNAL | 0.78 | 5.09 | -13.05 | 174. | 88. |
| RESULTANT | 0.79 | 10.79 | 0.22 | 88. | 209. |
| NORM RESULTANT | 0.08 | 1.70 | 0.02 | 88. | 209. |
| AT EXTERNAL | -7.91 | 706.74 | -375.78 | 132. | 78. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 3.44 | -12.01 | 193. | 84. |
| Y AXIS EXTERNAL | -0.01 | 2.66 | -2.26 | 70. | 84. |
| Z AXIS EXTERNAL | 0.00 | 20.82 | -4.02 | 71. | 185. |
| RESULTANT | 0.89 | 22.72 | 0.15 | 71. | 235. |
| NORM RESULTANT | 0.09 | 2.31 | 0.02 | 71. | 235. |
| SHOULDER LOADS (LB) | | | | | |
| TENSION | 83.98 | 908.59 | 89.27 | 88. | 195. |
| LEFT TENSION ORA | 48.87 | 241.71 | 29.03 | 85. | 173. |
| RIGHT TENSION ORA | 48.44 | 286.35 | 41.54 | 85. | 175. |
| LEG LOADS (LB) | | | | | |
| LEFT TENSION ORA | 24.81 | 248.55 | 21.87 | 85. | 170. |
| RIGHT TENSION ORA | 32.12 | 210.91 | 26.15 | 85. | 509. |
| ANCHOR LOADS (LB) | | | | | |
| LEFT 45 DEG X AXIS | 32.44 | 512.82 | 31.30 | 85. | 177. |
| LEFT 45 DEG Y AXIS | 5.80 | 71.33 | 1.74 | 85. | 203. |
| LEFT 45 DEG Z AXIS | 16.17 | 300.67 | 9.01 | 83. | 181. |
| LEFT 45 DEG RESULTANT | 36.79 | 598.83 | 93.41 | 85. | 189. |
| RIGHT 45 DEG X AXIS | 28.04 | 478.18 | 21.47 | 84. | 495. |
| RIGHT 45 DEG Y AXIS | 5.49 | 85.15 | 2.67 | 83. | 174. |
| RIGHT 45 DEG Z AXIS | 28.27 | 347.82 | 19.87 | 86. | 470. |
| RIGHT 45 DEG RESULTANT | 37.42 | 597.11 | 29.52 | 86. | 495. |
| AT VERTICAL X AXIS | -1.25 | 87.11 | -1.80 | 94. | 0. |
| AT VERTICAL Y AXIS | 3.52 | 7.59 | -1.07 | 185. | 74. |
| AT VERTICAL Z AXIS | 61.20 | 234.77 | 32.14 | 88. | 41. |
| AT VERTICAL RESULTANT | 61.32 | 244.17 | 33.56 | 94. | 41. |
| SEAT LOADS (LB) | | | | | |
| LEFT LINK X AXIS | 20.18 | 83.80 | -194.49 | 136. | 83. |
| RIGHT LINK X AXIS | 23.45 | 56.91 | -99.37 | 513. | 82. |
| X AXIS SUM | 43.83 | 118.30 | -293.88 | 319. | 83. |
| X AXIS MINUS TARE | 44.19 | 114.92 | -142.47 | 310. | 80. |
| CENTER LINK Y AXIS | 46.33 | 48.86 | -167.53 | 209. | 89. |
| LEFT Z AXIS | 78.40 | 749.21 | 58.46 | 88. | 196. |
| RIGHT Z AXIS | 28.84 | 553.76 | -3.62 | 79. | 208. |
| CENTER Z AXIS | 200.44 | 1101.17 | 201.16 | 88. | 0. |
| Z AXIS SUM | 308.68 | 2382.66 | 308.76 | 88. | 1. |
| Z AXIS MINUS TARE | 308.42 | 2290.87 | 308.01 | 88. | 1. |
| RESULTANT | 315.18 | 2404.62 | 316.08 | 88. | 1. |
| RESULTANT MINUS TARE | 314.99 | 2301.38 | 314.91 | 88. | 1. |

CREST STUDY -GX TEST: 3072 SUBJ: D-3 WT: 214.0 NOM G: 10.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK | | | | -82. | |
| 2.5V EXT PWR | | 2.50 | 2.50 | 8. | |
| 10V EXT PWR | | 10.01 | 9.99 | 2. | 107. |
| | | | | 23. | |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.62 | -9.98 | 157. | 55. |
| Y AXIS | 0.00 | 0.38 | -0.94 | 290. | 320. |
| Z AXIS | 1.00 | 2.57 | -0.66 | 54. | 49. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.12 | 2.36 | -10.54 | 159. | 48. |
| Y AXIS | 0.00 | 1.58 | -1.50 | 160. | 172. |
| Z AXIS | 0.88 | 8.14 | -0.53 | 54. | 165. |
| SLED VELOCITY (IFT/S) | 0.00 | 90.68 | 0.00 | 157. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 2.17 | -14.17 | 175. | 79. |
| Y AXIS EXTERNAL | -0.01 | 5.20 | -0.90 | 94. | 213. |
| Z AXIS EXTERNAL | 0.85 | 10.16 | -1.29 | 57. | 238. |
| RESULTANT | 0.88 | 16.05 | 0.28 | 79. | 232. |
| NORM RESULTANT | 0.08 | 1.81 | 0.03 | 79. | 232. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 2.85 | -12.26 | 261. | 100. |
| Y AXIS EXTERNAL | -0.01 | 1.45 | -0.94 | 207. | 275. |
| Z AXIS EXTERNAL | 0.88 | 3.20 | -12.37 | 341. | 95. |
| RESULTANT | 0.89 | 17.13 | 0.16 | 96. | 20. |
| NORM RESULTANT | 0.09 | 1.72 | 0.02 | 96. | 20. |
| RY EXTERNAL | 2.23 | 479.85 | -348.05 | 126. | 241. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.11 | 4.13 | -14.90 | 193. | 79. |
| Y AXIS EXTERNAL | -0.01 | 4.30 | -4.04 | 78. | 72. |
| Z AXIS EXTERNAL | 0.88 | 33.39 | -5.29 | 74. | 180. |
| RESULTANT | 0.88 | 35.35 | 0.29 | 74. | 255. |
| NORM RESULTANT | 0.08 | 3.54 | 0.03 | 74. | 255. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 99.52 | 1037.31 | 19.54 | 88. | 196. |
| LEFT TENSION QRA | 58.53 | 242.66 | 36.88 | 82. | 180. |
| RIGHT TENSION QRA | 59.23 | 261.78 | 43.63 | 84. | 174. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 25.20 | 220.62 | 24.90 | 85. | 3. |
| RIGHT TENSION QRA | 23.24 | 174.84 | 20.87 | 83. | 173. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT 45 DEG X AXIS | 42.06 | 545.90 | 1.22 | 84. | 281. |
| LEFT 45 DEG Y AXIS | 2.89 | 10.35 | -7.05 | 110. | 55. |
| LEFT 45 DEG Z AXIS | 21.15 | 304.00 | -8.55 | 89. | 273. |
| LEFT 45 DEG RESULTANT | 47.19 | 624.84 | 7.34 | 84. | 304. |
| RIGHT 45 DEG X AXIS | 32.38 | 507.88 | 0.00 | 86. | 292. |
| RIGHT 45 DEG Y AXIS | 2.75 | 51.71 | -3.52 | 83. | 162. |
| RIGHT 45 DEG Z AXIS | 32.11 | 348.05 | 3.96 | 85. | 275. |
| RIGHT 45 DEG RESULTANT | 45.70 | 618.50 | 4.28 | 87. | 292. |
| AT VERTICAL X AXIS | 8.48 | 150.80 | 8.69 | 92. | 4. |
| AT VERTICAL Y AXIS | 2.18 | 6.41 | -1.12 | 166. | 55. |
| AT VERTICAL Z AXIS | 87.91 | 255.35 | 21.25 | 92. | 44. |
| AT VERTICAL RESULTANT | 88.35 | 286.92 | 32.44 | 92. | 44. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 18.28 | 81.54 | -207.24 | 177. | 79. |
| RIGHT LINK X AXIS | 38.01 | 61.65 | -89.97 | 203. | 80. |
| X AXIS SUM | 56.29 | 143.55 | -297.21 | 520. | 81. |
| X AXIS MINUS TARE | 58.88 | 139.88 | -141.10 | 512. | 86. |
| CENTER LINK Y AXIS | -31.70 | 14.56 | -294.97 | 514. | 76. |
| LEFT Z AXIS | 71.38 | 821.03 | 7.18 | 84. | 510. |
| RIGHT Z AXIS | 48.41 | 642.88 | 9.44 | 88. | 211. |
| CENTER Z AXIS | 293.83 | 1186.34 | 205.81 | 78. | 1. |
| Z AXIS SUM | 814.81 | 2510.05 | 366.62 | 87. | 211. |
| Z AXIS MINUS TARE | 814.41 | 2511.52 | 370.35 | 88. | 213. |
| RESULTANT | 419.82 | 2833.43 | 380.59 | 87. | 222. |
| RESULTANT MINUS TARE | 419.46 | 2524.22 | 385.21 | 87. | 225. |

CREST STUDY -GX TEST: 3087 SUBJ: K-3 WT: 135.0 NOM G: 10.0 CELL: 8

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 0.99 | 19. 0. | 448. 42. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.52 | -10.00 | 175. | 58. |
| Y AXIS | 0.00 | 0.90 | -0.23 | 174. | 120. |
| Z AXIS | 1.00 | 2.30 | -0.58 | 57. | 53. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.12 | 2.23 | -10.50 | 156. | 51. |
| Y AXIS | 0.00 | 1.29 | -1.58 | 178. | 169. |
| Z AXIS | 0.67 | 7.89 | -0.99 | 58. | 161. |
| SLED VELOCITY (FT/S) | 0.00 | 30.80 | 0.00 | 156. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 1.90 | -14.88 | 168. | 82. |
| Y AXIS EXTERNAL | 0.00 | 9.29 | -5.31 | 95. | 89. |
| Z AXIS EXTERNAL | 0.88 | 21.05 | -1.50 | 88. | 188. |
| RESULTANT | 0.89 | 25.04 | 0.92 | 96. | 349. |
| NORM RESULTANT | 0.09 | 2.50 | 0.09 | 96. | 349. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.13 | 1.81 | -8.05 | 191. | 82. |
| Y AXIS EXTERNAL | -0.01 | 2.48 | -0.49 | 84. | 302. |
| Z AXIS EXTERNAL | 0.83 | 4.12 | -18.50 | 186. | 80. |
| RESULTANT | 0.84 | 20.27 | 0.78 | 81. | 9. |
| NORM RESULTANT | 0.08 | 2.03 | 0.08 | 81. | 9. |
| RT EXTERNAL | -1.11 | 450.41 | -404.88 | 130. | 69. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.19 | 2.40 | -12.80 | 181. | 82. |
| Y AXIS EXTERNAL | 0.00 | 1.66 | -3.42 | 43. | 98. |
| Z AXIS EXTERNAL | 0.88 | 14.76 | -1.97 | 68. | 43. |
| RESULTANT | 0.87 | 17.44 | 0.52 | 69. | 353. |
| NORM RESULTANT | 0.09 | 1.74 | 0.05 | 69. | 353. |
| SHOULDER LOADS (LB) | | | | | |
| TENSION | 70.03 | 777.88 | 23.17 | 86. | 194. |
| LEFT TENSION QRA | 28.64 | 160.67 | 18.82 | 80. | 178. |
| RIGHT TENSION QRA | 29.94 | 197.83 | 28.16 | 80. | 8. |
| LEG LOADS (LB) | | | | | |
| LEFT TENSION QRA | 12.12 | 192.45 | 12.21 | 83. | 0. |
| RIGHT TENSION QRA | 13.47 | 150.77 | 12.20 | 81. | 6. |
| ANCHOR LOADS (LB) | | | | | |
| LEFT 45 DEG X AXIS | 19.38 | 399.35 | 16.50 | 87. | 328. |
| LEFT 45 DEG Y AXIS | 3.79 | 77.98 | -0.01 | 86. | 208. |
| LEFT 45 DEG Z AXIS | 10.65 | 254.95 | 6.76 | 86. | 197. |
| LEFT 45 DEG RESULTANT | 22.46 | 480.17 | 19.00 | 80. | 328. |
| RIGHT 45 DEG X AXIS | 11.74 | 383.18 | 10.41 | 87. | 0. |
| RIGHT 45 DEG Y AXIS | 1.40 | 60.78 | -3.44 | 87. | 193. |
| RIGHT 45 DEG Z AXIS | 14.50 | 281.45 | 9.79 | 88. | 195. |
| RIGHT 45 DEG RESULTANT | 18.75 | 478.31 | 15.85 | 88. | 210. |
| RT VERTICAL X AXIS | -5.32 | 88.87 | -6.43 | 94. | 0. |
| RT VERTICAL Y AXIS | 0.60 | 4.85 | -5.03 | 163. | 59. |
| RT VERTICAL Z AXIS | 33.11 | 226.43 | 8.10 | 91. | 38. |
| RT VERTICAL RESULTANT | 33.57 | 241.86 | 8.32 | 91. | 37. |
| SEAT LOADS (LB) | | | | | |
| LEFT LINK X AXIS | 49.93 | 42.21 | -158.90 | 0. | 84. |
| RIGHT LINK X AXIS | 19.78 | 19.22 | -126.57 | 0. | 83. |
| X AXIS SUM | 69.08 | 61.43 | -285.54 | 0. | 84. |
| X AXIS MINUS TARE | 63.29 | 99.11 | -133.70 | 38. | 93. |
| CENTER LINK Y AXIS | -36.28 | -4.99 | -153.63 | 229. | 92. |
| LEFT Z AXIS | 21.71 | 471.39 | 15.83 | 84. | 309. |
| RIGHT Z AXIS | 31.64 | 500.66 | 2.11 | 93. | 212. |
| CENTER Z AXIS | 118.68 | 775.93 | 117.16 | 93. | 1. |
| Z AXIS SUM | 170.03 | 1743.93 | 172.08 | 93. | 2. |
| Z AXIS MINUS TARE | 169.94 | 1655.30 | 169.45 | 93. | 2. |
| RESULTANT | 184.95 | 1771.01 | 175.25 | 93. | 232. |
| RESULTANT MINUS TARE | 184.94 | 1667.80 | 177.59 | 93. | 232. |

CREST STUDY -GX TEST: 3080 SUBJ: M19 WT: 184.0 NOM G: 10.0 CELL: B

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|----------------------|-----------------|
| REFERENCE MARK 2.5V EXT PHR 10V EXT PNR | | 2.50 10.01 | 2.50 9.99 | -105. 176. 12. | 0. 29. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.48 | -10.01 | 175. | 56. |
| Y AXIS | 0.00 | 0.92 | -0.41 | 240. | 116. |
| Z AXIS | 1.00 | 2.32 | -0.57 | 56. | 51. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.12 | 2.34 | -10.49 | 156. | 50. |
| Y AXIS | 0.00 | 1.43 | -1.24 | 246. | 169. |
| Z AXIS | 0.87 | 6.00 | -0.26 | 56. | 161. |
| SLED VELOCITY (FT/S) | 0.00 | 30.32 | 0.00 | 155. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 3.41 | -16.48 | 187. | 90. |
| Y AXIS EXTERNAL | 0.01 | 2.15 | -1.33 | 112. | 79. |
| Z AXIS EXTERNAL | 0.87 | 6.98 | -2.80 | 101. | 232. |
| RESULTANT | 0.88 | 17.88 | 0.42 | 91. | 249. |
| NORM RESULTANT | 0.09 | 1.79 | 0.04 | 91. | 249. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 2.51 | -11.45 | 281. | 112. |
| Y AXIS EXTERNAL | 0.00 | 0.84 | -0.98 | 233. | 109. |
| Z AXIS EXTERNAL | 0.84 | 3.52 | -16.66 | 188. | 93. |
| RESULTANT | 0.85 | 18.44 | 0.65 | 97. | 19. |
| NORM RESULTANT | 0.08 | 1.84 | 0.06 | 97. | 19. |
| RT EXTERNAL | -1.12 | 609.48 | -325.58 | 138. | 105. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.11 | 2.84 | -11.68 | 173. | 87. |
| Y AXIS EXTERNAL | 0.00 | 2.38 | -2.77 | 105. | 22. |
| Z AXIS EXTERNAL | 0.87 | 12.57 | -3.95 | 105. | 23. |
| RESULTANT | 0.88 | 16.61 | 0.42 | 89. | 205. |
| NORM RESULTANT | 0.09 | 1.88 | 0.04 | 89. | 205. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 62.33 | 891.71 | 14.15 | 88. | 290. |
| LEFT TENSION QRA | 31.95 | 204.27 | 17.50 | 85. | 163. |
| RIGHT TENSION QRA | 28.65 | 215.19 | 26.13 | 83. | 0. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 14.63 | 298.16 | 19.60 | 86. | 1. |
| RIGHT TENSION QRA | 12.50 | 197.17 | 11.23 | 86. | 8. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT 45 DEG X AXIS | 15.33 | 807.91 | 13.89 | 91. | 1. |
| LEFT 45 DEG Y AXIS | 2.03 | 67.86 | -1.62 | 87. | 183. |
| LEFT 45 DEG Z AXIS | 5.58 | 353.04 | 3.72 | 89. | 3. |
| LEFT 45 DEG RESULTANT | 16.50 | 706.15 | 16.30 | 91. | 1. |
| RIGHT 45 DEG X AXIS | 17.41 | 805.26 | 17.41 | 93. | 0. |
| RIGHT 45 DEG Y AXIS | 0.78 | 54.38 | -3.44 | 82. | 173. |
| RIGHT 45 DEG Z AXIS | 20.09 | 445.18 | 19.33 | 91. | 0. |
| RIGHT 45 DEG RESULTANT | 26.82 | 751.77 | 26.02 | 93. | 0. |
| RT VERTICAL X AXIS | -4.07 | 118.08 | -8.03 | 95. | 0. |
| RT VERTICAL Y AXIS | 1.46 | 5.88 | -4.00 | 164. | 219. |
| RT VERTICAL Z AXIS | 24.44 | 237.95 | -9.92 | 97. | 55. |
| RT VERTICAL RESULTANT | 24.84 | 266.88 | 7.40 | 97. | 93. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 12.70 | 79.89 | -202.25 | 175. | 83. |
| RIGHT LINK X AXIS | 17.83 | 39.70 | -141.08 | 191. | 96. |
| X AXIS SUM | 30.33 | 108.57 | -336.18 | 175. | 94. |
| X AXIS MINUS TARE | 30.71 | 102.08 | -196.95 | 177. | 90. |
| CENTER LINK Y AXIS | -66.63 | 3.91 | -236.24 | 244. | 89. |
| LEFT Z AXIS | 41.70 | 792.20 | 9.00 | 94. | 235. |
| RIGHT Z AXIS | 35.98 | 697.76 | 19.41 | 99. | 225. |
| CENTER Z AXIS | 138.42 | 1127.89 | 138.19 | 102. | 0. |
| Z AXIS SUM | 218.10 | 2538.18 | 192.33 | 97. | 233. |
| Z AXIS MINUS TARE | 215.98 | 2459.47 | 196.80 | 97. | 233. |
| RESULTANT | 228.17 | 2588.09 | 192.85 | 97. | 233. |
| RESULTANT MINUS TARE | 228.08 | 2477.42 | 197.47 | 97. | 233. |

CREST STUDY -GX TEST: 3107 SUBJ: P-S WT: 182.0 NORM G: 10.0 CELL: 0

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|----------------------|-----------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 9.99 | -130. 25. 126. | 19. 13. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.54 | -9.91 | 157. | 55. |
| Y AXIS | 0.00 | 0.49 | -0.46 | 168. | 293. |
| Z AXIS | 1.00 | 2.45 | -0.68 | 55. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.12 | 2.98 | -10.48 | 159. | 49. |
| Y AXIS | 0.00 | 1.40 | -1.15 | 225. | 172. |
| Z AXIS | 0.87 | 0.21 | -0.69 | 55. | 165. |
| SLED VELOCITY (FT/S) | 0.00 | 30.51 | 0.00 | 158. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 1.54 | -14.44 | 178. | 91. |
| Y AXIS EXTERNAL | 0.00 | 3.75 | -1.44 | 79. | 178. |
| Z AXIS EXTERNAL | 0.87 | 0.71 | -1.84 | 71. | 210. |
| RESULTANT | 0.88 | 14.92 | 0.49 | 91. | 295. |
| NORM RESULTANT | 0.09 | 1.51 | 0.05 | 91. | 295. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.19 | 1.84 | -10.58 | 248. | 99. |
| Y AXIS EXTERNAL | 0.03 | 0.80 | -0.87 | 132. | 173. |
| Z AXIS EXTERNAL | 0.87 | 2.68 | -16.07 | 141. | 89. |
| RESULTANT | 0.88 | 16.41 | 0.57 | 89. | 20. |
| NORM RESULTANT | 0.08 | 1.86 | 0.06 | 89. | 20. |
| RT EXTERNAL | 0.60 | 663.92 | -376.73 | 141. | 68. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.01 | 2.53 | -14.45 | 161. | 85. |
| Y AXIS EXTERNAL | 0.00 | 1.75 | -2.84 | 166. | 98. |
| Z AXIS EXTERNAL | 0.01 | 3.56 | -3.24 | 40. | 103. |
| RESULTANT | 0.03 | 14.56 | 0.04 | 85. | 343. |
| NORM RESULTANT | 0.00 | 1.47 | 0.00 | 85. | 343. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.13 | 7.76 | -11.85 | 172. | 76. |
| Y AXIS EXTERNAL | 0.00 | 9.38 | -2.23 | 62. | 214. |
| Z AXIS EXTERNAL | 0.88 | 16.79 | -5.81 | 63. | 168. |
| RESULTANT | 0.89 | 18.18 | 0.35 | 63. | 44. |
| NORM RESULTANT | 0.09 | 1.83 | 0.04 | 63. | 44. |
| SHOULDER LOADS (LB) | | | | | |
| TENSION | 82.17 | 969.97 | 24.24 | 94. | 212. |
| LEFT TENSION QRA | 27.57 | 124.00 | 19.57 | 73. | 178. |
| RIGHT TENSION QRA | 33.54 | 171.61 | 31.03 | 78. | 169. |
| LEG LOADS (LB) | | | | | |
| ANCHOR LOADS (LB) | | | | | |
| LEFT HORIZ X AXIS | 29.59 | 589.67 | 23.29 | 81. | 437. |
| LEFT HORIZ Y AXIS | -.06 | 65.18 | 3.71 | 83. | 185. |
| LEFT HORIZ Z AXIS | 16.75 | -14.98 | -77.03 | 408. | 81. |
| LEFT HORIZ RESULTANT | 34.73 | 598.24 | 28.34 | 83. | 437. |
| RIGHT HORIZ X AXIS | 25.84 | 557.00 | 24.54 | 82. | 195. |
| RIGHT HORIZ Y AXIS | 2.27 | 59.03 | -1.34 | 81. | 194. |
| RIGHT HORIZ Z AXIS | 0.81 | 21.97 | -4.33 | 81. | 32. |
| RIGHT HORIZ RESULTANT | 25.75 | 560.49 | 24.55 | 82. | 197. |
| RT VERTICAL X AXIS | 6.82 | 50.68 | 5.25 | 90. | 0. |
| RT VERTICAL Y AXIS | 7.17 | 11.01 | 3.48 | 165. | 55. |
| RT VERTICAL Z AXIS | 84.47 | 403.36 | 53.18 | 89. | 18. |
| RT VERTICAL RESULTANT | 65.21 | 406.43 | 54.89 | 89. | 18. |
| SEAT LOADS (LB) | | | | | |
| LEFT LINK X AXIS | 24.11 | 59.37 | -170.73 | 178. | 83. |
| RIGHT LINK X AXIS | 17.04 | 43.41 | -125.70 | 455. | 83. |
| X AXIS SUM | 41.05 | 98.00 | -296.44 | 455. | 83. |
| X AXIS MINUS TARE | 42.24 | 95.28 | -150.73 | 459. | 86. |
| CENTER LINK Y AXIS | -54.02 | -11.88 | -208.88 | 224. | 79. |
| LEFT Z AXIS | 32.80 | 585.69 | 1.95 | 84. | 435. |
| RIGHT Z AXIS | 30.67 | 532.68 | 3.16 | 85. | 204. |
| CENTER Z AXIS | 193.30 | 940.00 | 182.35 | 80. | 223. |
| Z AXIS SUM | 256.57 | 2059.16 | 213.81 | 85. | 223. |
| Z AXIS MINUS TARE | 256.49 | 1973.04 | 220.21 | 83. | 216. |
| RESULTANT | 263.89 | 2080.10 | 215.74 | 85. | 223. |
| RESULTANT MINUS TARE | 265.86 | 1988.46 | 224.08 | 83. | 226. |

CREST STUDY -GX TEST: 3146 SUBJ: D-5 WT: 171.0 NOM G: 10.0 CELL: 0

| DATA ID | IMMEDIATE PRE IMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|-------------------------|------------------|------------------|---------------------|--------------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 9.99 | -194. 19. 33. | 2. 1. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.46 | -10.02 | 173. | 56. |
| Y AXIS | 0.00 | 0.30 | -0.43 | 266. | 292. |
| Z AXIS | 1.00 | 2.53 | -0.70 | 55. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.19 | 1.94 | -10.61 | 157. | 49. |
| Y AXIS | 0.00 | 1.29 | -0.97 | 229. | 170. |
| Z AXIS | 0.87 | 8.18 | 0.07 | 55. | 163. |
| SLED VELOCITY (FT/S) | 0.00 | 30.42 | 0.00 | 159. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.19 | 7.03 | -15.34 | 82. | 80. |
| Y AXIS EXTERNAL | -0.01 | 13.83 | -3.20 | 89. | 178. |
| Z AXIS EXTERNAL | 0.86 | 13.47 | -9.08 | 96. | 175. |
| RESULTANT | 0.87 | 16.20 | 0.40 | 94. | 224. |
| NORM RESULTANT | 0.09 | 1.82 | 0.04 | 94. | 224. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.12 | 2.16 | -11.76 | 227. | 98. |
| Y AXIS EXTERNAL | -0.03 | 0.82 | -0.82 | 236. | 155. |
| Z AXIS EXTERNAL | 0.64 | 3.14 | -14.64 | 136. | 85. |
| RESULTANT | 0.85 | 16.14 | 0.18 | 90. | 20. |
| NORM RESULTANT | 0.08 | 1.81 | 0.02 | 90. | 20. |
| AT EXTERNAL | -1.28 | 538.66 | -340.04 | 129. | 78. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.01 | 1.85 | -19.59 | 192. | 90. |
| Y AXIS EXTERNAL | 0.00 | 2.27 | -3.94 | 113. | 105. |
| Z AXIS EXTERNAL | 0.01 | 4.54 | -4.53 | 50. | 99. |
| RESULTANT | 0.03 | 19.74 | 0.04 | 90. | 319. |
| NORM RESULTANT | 0.00 | 1.37 | 0.00 | 90. | 319. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.19 | 1.48 | -11.05 | 178. | 85. |
| Y AXIS EXTERNAL | 0.01 | 5.85 | -1.28 | 77. | 90. |
| Z AXIS EXTERNAL | 0.88 | 15.44 | -3.27 | 79. | 184. |
| RESULTANT | 0.89 | 19.52 | 0.41 | 78. | 234. |
| NORM RESULTANT | 0.09 | 1.95 | 0.04 | 78. | 234. |
| SHOULDER LOADS (LB) | | | | | |
| TENSION | 131.49 | 811.77 | 72.72 | 92. | 266. |
| LEFT TENSION QRA | 52.00 | 172.31 | 90.45 | 85. | 173. |
| RIGHT TENSION QRA | 40.98 | 138.31 | 31.66 | 84. | 300. |
| LEG LOADS (LB) | | | | | |
| ANCHOR LOADS (LB) | | | | | |
| LEFT HORIZ X AXIS | 50.43 | 589.15 | 36.29 | 84. | 333. |
| LEFT HORIZ Y AXIS | 9.57 | 66.06 | 1.11 | 86. | 304. |
| LEFT HORIZ Z AXIS | -16.82 | -14.48 | -79.97 | 394. | 87. |
| LEFT HORIZ RESULTANT | 53.45 | 572.33 | 39.17 | 84. | 402. |
| RIGHT HORIZ X AXIS | 47.08 | 559.37 | 37.07 | 84. | 393. |
| RIGHT HORIZ Y AXIS | 5.10 | 83.74 | 1.54 | 83. | 192. |
| RIGHT HORIZ Z AXIS | 0.89 | 20.71 | -4.98 | 82. | 35. |
| RIGHT HORIZ RESULTANT | 47.37 | 565.99 | 37.18 | 84. | 395. |
| AT VERTICAL X AXIS | -16.26 | 24.44 | -15.45 | 110. | 0. |
| AT VERTICAL Y AXIS | 7.94 | 22.00 | 8.95 | 85. | 24. |
| AT VERTICAL Z AXIS | 105.22 | 398.56 | 95.61 | 86. | 23. |
| AT VERTICAL RESULTANT | 106.76 | 398.67 | 96.25 | 86. | 31. |
| SEAT LOADS (LB) | | | | | |
| LEFT LINK X AXIS | 31.91 | 86.60 | -148.71 | 159. | 84. |
| RIGHT LINK X AXIS | -4.21 | 17.88 | -157.27 | 191. | 81. |
| X AXIS SUM | 27.70 | 91.51 | -302.81 | 176. | 84. |
| X AXIS MINUS TARE | 27.71 | 89.30 | -153.42 | 186. | 86. |
| CENTER LINK Y AXIS | -42.22 | -8.04 | -194.41 | 223. | 77. |
| LEFT Z AXIS | 30.12 | 656.08 | 8.51 | 91. | 297. |
| RIGHT Z AXIS | 36.51 | 486.48 | 31.99 | 100. | 201. |
| CENTER Z AXIS | 204.94 | 941.02 | 204.93 | 79. | 0. |
| Z AXIS SUM | 270.97 | 2026.58 | 271.33 | 91. | 0. |
| Z AXIS MINUS TARE | 270.88 | 1938.04 | 269.62 | 93. | 0. |
| RESULTANT | 275.04 | 2056.21 | 275.98 | 91. | 0. |
| RESULTANT MINUS TARE | 275.55 | 1950.98 | 274.65 | 91. | 0. |

CREST STUDY -GX TEST: 3144 SUBJ: 419 WT: 189.0 NORM G: 10.0 CELL: 0

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|-----------------|-----------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 9.99 | -209. 1. | 106. 23. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.50 | -9.92 | 159. | 56. |
| Y AXIS | 0.00 | 0.30 | -0.38 | 259. | 110. |
| Z AXIS | 1.00 | 2.50 | -0.68 | 56. | 51. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 2.28 | -10.12 | 159. | 50. |
| Y AXIS | 0.00 | 1.27 | -1.58 | 180. | 172. |
| Z AXIS | 0.87 | 8.19 | -0.09 | 56. | 191. |
| SLED VELOCITY (FT/S) | 0.60 | 90.08 | 0.00 | 158. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.30 | 2.11 | -14.42 | 170. | 88. |
| Y AXIS EXTERNAL | 0.00 | 6.86 | -9.45 | 93. | 166. |
| Z AXIS EXTERNAL | 0.87 | 10.30 | -4.98 | 60. | 165. |
| RESULTANT | 1.01 | 16.37 | 0.49 | 89. | 253. |
| NORM RESULTANT | 0.10 | 1.65 | 0.05 | 89. | 253. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.50 | 3.34 | -10.31 | 284. | 127. |
| Y AXIS EXTERNAL | 0.02 | 0.74 | -1.19 | 229. | 138. |
| Z AXIS EXTERNAL | 0.88 | 3.29 | -15.90 | 150. | 97. |
| RESULTANT | 1.02 | 17.79 | 0.45 | 99. | 206. |
| NORM RESULTANT | 0.10 | 1.79 | 0.05 | 99. | 206. |
| RT EXTERNAL | 1.13 | 676.95 | -243.35 | 150. | 103. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 1.98 | -13.31 | 215. | 66. |
| Y AXIS EXTERNAL | 0.00 | 1.73 | -2.37 | 289. | 65. |
| Z AXIS EXTERNAL | 0.87 | 10.23 | -2.04 | 46. | 33. |
| RESULTANT | 0.98 | 19.59 | 0.74 | 86. | 246. |
| NORM RESULTANT | 0.10 | 1.37 | 0.07 | 86. | 246. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.49 | -11.27 | 178. | 77. |
| Y AXIS EXTERNAL | 0.00 | 4.74 | -4.02 | 59. | 30. |
| Z AXIS EXTERNAL | 0.88 | 11.12 | -4.01 | 82. | 33. |
| RESULTANT | 1.01 | 15.95 | 0.71 | 83. | 220. |
| NORM RESULTANT | 0.10 | 1.55 | 0.07 | 83. | 220. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 62.89 | 977.22 | 16.03 | 92. | 280. |
| LEFT TENSION QRA | 25.14 | 183.18 | 23.69 | 76. | 173. |
| RIGHT TENSION QRA | 41.34 | 210.07 | 99.70 | 74. | 272. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 20.49 | 187.62 | 19.55 | 77. | 12. |
| RIGHT TENSION QRA | 14.49 | 125.99 | 19.46 | 77. | 16. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 46.25 | 709.18 | 36.23 | 84. | 238. |
| LEFT HORIZ Y AXIS | 3.90 | 66.33 | -0.09 | 90. | 268. |
| LEFT HORIZ Z AXIS | -19.71 | -19.14 | -35.54 | 4. | 87. |
| LEFT HORIZ RESULTANT | 46.36 | 717.00 | 36.71 | 84. | 351. |
| RIGHT HORIZ X AXIS | 37.68 | 631.68 | 35.64 | 85. | 0. |
| RIGHT HORIZ Y AXIS | 2.89 | 65.91 | -0.87 | 81. | 195. |
| RIGHT HORIZ Z AXIS | 1.23 | 28.29 | -3.52 | 82. | 28. |
| RIGHT HORIZ RESULTANT | 37.82 | 835.74 | 35.78 | 85. | 0. |
| RT VERTICAL X AXIS | -10.69 | 10.50 | -11.68 | 94. | 0. |
| RT VERTICAL Y AXIS | 4.28 | 21.36 | 9.08 | 78. | 6. |
| RT VERTICAL Z AXIS | 62.01 | 336.51 | 47.33 | 86. | 30. |
| RT VERTICAL RESULTANT | 63.11 | 937.27 | 47.54 | 86. | 30. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 17.87 | 86.10 | -204.88 | 197. | 83. |
| RIGHT LINK X AXIS | 33.40 | 32.82 | -41.82 | 0. | 84. |
| X AXIS SUM | 51.08 | 90.84 | -245.53 | 197. | 83. |
| X AXIS MINUS TARE | 51.38 | 95.31 | -35.12 | 97. | 87. |
| CENTER LINK Y AXIS | -78.73 | 7.74 | -230.53 | 225. | 80. |
| LEFT Z AXIS | 61.01 | 620.34 | 9.55 | 84. | 221. |
| RIGHT Z AXIS | 16.45 | 363.32 | 16.50 | 84. | 0. |
| CENTER Z AXIS | 204.60 | 986.61 | 207.22 | 81. | 0. |
| Z AXIS SUM | 262.05 | 1862.53 | 254.94 | 82. | 235. |
| Z AXIS MINUS TARE | 281.97 | 1874.98 | 261.80 | 84. | 236. |
| RESULTANT | 287.26 | 1880.85 | 259.02 | 82. | 236. |
| RESULTANT MINUS TARE | 297.29 | 1880.60 | 265.51 | 84. | 236. |

CREST STUDY -GX TEST: 3124 SUBJ: M16 WT: 196.0 NOM G: 10.0 CELL: 0

| DATA ID | IMMEDIATE PRE IMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|-------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.49 -9.98 | 3. 1. | 50. 50. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.54 | -9.49 | 159. | 56. |
| Y AXIS | 0.00 | 0.35 | -0.31 | 265. | 116. |
| Z AXIS | 1.00 | 2.61 | -0.73 | 55. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.49 | 2.45 | -10.14 | 160. | 49. |
| Y AXIS | 0.00 | 1.34 | -1.54 | 181. | 174. |
| Z AXIS | 0.87 | 8.33 | -0.55 | 55. | 167. |
| SLED VELOCITY (FT/S) | 0.00 | 30.23 | 40.00 | 157. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | -0.49 | 7.90 | -31.03 | 114. | 92. |
| Y AXIS EXTERNAL | -0.01 | 8.20 | -4.94 | 105. | 122. |
| Z AXIS EXTERNAL | 0.87 | 17.70 | -4.37 | 103. | 183. |
| RESULTANT | 1.00 | 19.47 | -9.31 | 103. | 209. |
| NORM RESULTANT | 0.10 | 1.97 | 40.05 | 103. | 209. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.51 | 2.97 | -10.60 | 271. | 122. |
| Y AXIS EXTERNAL | 0.02 | 0.97 | -0.78 | 93. | 252. |
| Z AXIS EXTERNAL | 0.91 | 4.58 | -18.71 | 139. | 86. |
| RESULTANT | 1.04 | 20.95 | -0.84 | 86. | 202. |
| NORM RESULTANT | 0.11 | 2.12 | 40.08 | 86. | 202. |
| AT EXTERNAL | 1.10 | 856.94 | -526.48 | 139. | 84. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.49 | 1.68 | -13.08 | 185. | 85. |
| Y AXIS EXTERNAL | 0.00 | 1.63 | -3.04 | 102. | 60. |
| Z AXIS EXTERNAL | 0.67 | 6.55 | -4.51 | 61. | 104. |
| RESULTANT | 1.00 | 14.01 | -0.71 | 85. | 314. |
| NORM RESULTANT | 0.10 | 1.42 | 40.07 | 85. | 314. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 10.68 | -14.22 | 169. | 85. |
| Y AXIS EXTERNAL | 0.01 | 6.49 | -1.92 | 68. | 215. |
| Z AXIS EXTERNAL | 0.87 | 14.93 | -0.60 | 70. | 159. |
| RESULTANT | 1.00 | 18.99 | 0.49 | 70. | 225. |
| NORM RESULTANT | 0.10 | 1.92 | 40.05 | 70. | 225. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 65.53 | 830.12 | -50.96 | 91. | 235. |
| LEFT TENSION QRA | 33.82 | 172.40 | 23.45 | 82. | 222. |
| RIGHT TENSION QRA | 38.10 | 305.94 | 36.89 | 80. | 2. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 26.68 | 244.28 | 26.43 | 76. | 0. |
| RIGHT TENSION QRA | 20.82 | 178.07 | 20.92 | 76. | 1. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 57.60 | 889.48 | 52.18 | 79. | 338. |
| LEFT HORIZ Y AXIS | 1.27 | 45.25 | 0.02 | 78. | 185. |
| LEFT HORIZ Z AXIS | -15.13 | -14.08 | -68.48 | 392. | 76. |
| LEFT HORIZ RESULTANT | 58.78 | 706.04 | 54.40 | 79. | 338. |
| RIGHT HORIZ X AXIS | 44.47 | 877.64 | 40.84 | 80. | 335. |
| RIGHT HORIZ Y AXIS | 3.92 | 50.98 | -2.95 | 74. | 20. |
| RIGHT HORIZ Z AXIS | 1.43 | 28.71 | -3.33 | 74. | 34. |
| RIGHT HORIZ RESULTANT | 46.61 | 840.57 | 40.68 | 80. | 335. |
| AT VERTICAL X AXIS | -7.02 | 20.81 | -6.89 | 108. | 0. |
| AT VERTICAL Y AXIS | 2.65 | 7.08 | -0.45 | 53. | 174. |
| AT VERTICAL Z AXIS | 82.84 | 328.57 | 53.15 | 84. | 21. |
| AT VERTICAL RESULTANT | 63.29 | 328.11 | 53.24 | 84. | 21. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 16.61 | 28.47 | -189.70 | 197. | 78. |
| RIGHT LINK X AXIS | 30.28 | 50.20 | -61.60 | 197. | 79. |
| X AXIS SUM | 45.89 | 78.67 | -270.22 | 197. | 78. |
| X AXIS MINUS TARE | 46.01 | 89.28 | -109.75 | 48. | 75. |
| CENTER LINK Y AXIS | 58.80 | 58.70 | -101.03 | 0. | 78. |
| LEFT Z AXIS | 56.50 | 811.68 | 26.89 | 79. | 214. |
| RIGHT Z AXIS | 42.18 | 448.82 | 8.75 | 78. | 226. |
| CENTER Z AXIS | 175.13 | 1053.79 | 175.38 | 78. | 1. |
| Z AXIS SUM | 275.61 | 2155.42 | 255.87 | 79. | 226. |
| Z AXIS MINUS TARE | 275.68 | 2052.85 | 263.95 | 79. | 226. |
| RESULTANT | 205.93 | 2174.61 | 264.89 | 79. | 226. |
| RESULTANT MINUS TARE | 285.60 | 2057.77 | 272.09 | 79. | 226. |

CREST STUDY -GX TEST: 3123 SUBJ: M-2 WT: 185.0 NORM G: 10.0 CELL: D

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK 2.5V EXT PHR 10V EXT PHR | | 2.30 10.01 | 2.30 9.99 | -160. 2. 1. | 1. 0. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.50 | -9.93 | 159. | 56. |
| Y AXIS | 0.00 | 0.42 | -0.33 | 170. | 125. |
| Z AXIS | 1.00 | 2.56 | -0.71 | 56. | 51. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.30 | 2.62 | -20.13 | 160. | 50. |
| Y AXIS | 0.00 | 1.28 | -1.47 | 228. | 179. |
| Z AXIS | 0.37 | 0.14 | -0.31 | 56. | 202. |
| SLED VELOCITY (FT/S) | 0.00 | 30.01 | 30.00 | 161. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.42 | 1.47 | -24.32 | 219. | 93. |
| Y AXIS EXTERNAL | 0.00 | 2.79 | -1.38 | 80. | 167. |
| Z AXIS EXTERNAL | 0.87 | 8.22 | -1.31 | 113. | 170. |
| RESULTANT | 0.97 | 16.34 | 20.79 | 99. | 235. |
| NORM RESULTANT | 0.10 | 1.85 | 20.08 | 93. | 235. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.53 | 2.71 | -8.87 | 230. | 106. |
| Y AXIS EXTERNAL | -0.07 | 0.37 | -0.72 | 193. | 158. |
| Z AXIS EXTERNAL | 0.75 | 9.29 | -13.29 | 177. | 95. |
| RESULTANT | 0.92 | 15.28 | 20.72 | 100. | 6. |
| NORM RESULTANT | 0.09 | 1.54 | 20.07 | 100. | 6. |
| AT EXTERNAL | -0.78 | 240.21 | -120.37 | 135. | 66. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.15 | -44.08 | 160. | 92. |
| Y AXIS EXTERNAL | 0.00 | 1.93 | -1.74 | 189. | 286. |
| Z AXIS EXTERNAL | 0.87 | 6.83 | -1.17 | 52. | 69. |
| RESULTANT | 1.00 | 14.17 | 20.69 | 92. | 242. |
| NORM RESULTANT | 0.10 | 1.43 | 20.07 | 92. | 242. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.89 | -12.72 | 182. | 75. |
| Y AXIS EXTERNAL | -0.01 | 0.75 | -4.74 | 185. | 67. |
| Z AXIS EXTERNAL | 0.88 | 15.78 | -3.13 | 69. | 189. |
| RESULTANT | 1.00 | 18.15 | 20.59 | 70. | 37. |
| NORM RESULTANT | 0.10 | 1.93 | 20.06 | 70. | 37. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 148.32 | 364.38 | 40.98 | 93. | 201. |
| LEFT TENSION QRR | 25.36 | 148.39 | 16.38 | 77. | 189. |
| RIGHT TENSION QRR | 36.33 | 152.41 | 21.52 | 84. | 165. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRR | 18.48 | 180.27 | 12.10 | 83. | 170. |
| RIGHT TENSION QRR | 18.34 | 188.02 | 18.98 | 79. | 1. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 61.68 | 824.05 | -20.08 | 88. | 435. |
| LEFT HORIZ Y AXIS | 2.97 | 94.39 | -0.56 | 87. | 199. |
| LEFT HORIZ Z AXIS | -13.17 | -10.98 | -70.76 | 279. | 88. |
| LEFT HORIZ RESULTANT | 64.01 | 922.17 | 50.13 | 88. | 439. |
| RIGHT HORIZ X AXIS | 44.10 | 615.82 | 29.86 | 88. | 417. |
| RIGHT HORIZ Y AXIS | 3.76 | 73.31 | -1.18 | 90. | 196. |
| RIGHT HORIZ Z AXIS | 0.68 | 24.99 | -4.38 | 83. | 34. |
| RIGHT HORIZ RESULTANT | 46.22 | 630.24 | 29.89 | 88. | 435. |
| AT VERTICAL X AXIS | -20.16 | 4.38 | -19.99 | 121. | 0. |
| AT VERTICAL Y AXIS | 4.19 | 10.26 | -2.13 | 84. | 34. |
| AT VERTICAL Z AXIS | 20.67 | 258.10 | 79.75 | 91. | 25. |
| AT VERTICAL RESULTANT | 20.16 | 268.42 | 40.55 | 91. | 34. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 10.93 | 40.77 | -170.70 | 433. | 91. |
| RIGHT LINK X AXIS | 21.93 | 46.38 | -123.72 | 434. | 89. |
| X AXIS SUM | 32.86 | 45.99 | -203.42 | 433. | 91. |
| X AXIS MINUS TARE | 32.94 | 442.99 | -161.01 | 433. | 89. |
| CENTER LINK Y AXIS | 38.15 | 40.54 | -86.42 | 226. | 95. |
| LEFT Z AXIS | 43.46 | 204.97 | 21.83 | 92. | 235. |
| RIGHT Z AXIS | 48.46 | 243.26 | 2.78 | 91. | 422. |
| CENTER Z AXIS | 48.46 | 243.00 | 222.37 | 98. | 1. |
| Z AXIS SUM | 96.33 | 486.01 | 279.90 | 92. | 298. |
| Z AXIS MINUS TARE | 96.42 | 2060.51 | 263.83 | 93. | 238. |
| RESULTANT | 96.37 | 2161.07 | 278.14 | 92. | 238. |
| RESULTANT MINUS TARE | 96.38 | 2060.11 | 263.12 | 93. | 238. |

CREST STUDY -GX TEST: 3114 SUBJ: T-4 WT: 181.0 NOM G: 10.0 CELL: 0

| DATA ID | IMMEDIATE PHEIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|---------------------|-----------------|
| REFERENCE MARK 2.5V EXT PMA 10V EXT PMA | | 2.50 10.02 | 2.49 9.99 | -150. 95. 95. | 87. 47. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.49 | -9.98 | 158. | 57. |
| Y AXIS | 0.00 | 0.37 | -0.39 | 238. | 303. |
| Z AXIS | 1.00 | 2.42 | -0.67 | 57. | 52. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 2.78 | -10.15 | 160. | 51. |
| Y AXIS | 0.00 | 1.49 | -1.09 | 244. | 255. |
| Z AXIS | 0.97 | 0.09 | -0.59 | 57. | 166. |
| SLED VELOCITY (FT/S) | 0.00 | 30.35 | -0.00 | 158. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.30 | 2.62 | -14.74 | 202. | 104. |
| Y AXIS EXTERNAL | 0.00 | 5.43 | -0.94 | 104. | 213. |
| Z AXIS EXTERNAL | 0.07 | 0.13 | -1.48 | 104. | 206. |
| RESULTANT | 1.00 | 16.17 | -0.98 | 104. | 261. |
| NORM RESULTANT | 0.10 | 1.82 | -0.10 | 104. | 261. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.40 | -10.13 | 197. | 99. |
| Y AXIS EXTERNAL | 0.04 | 0.95 | -0.62 | 109. | 149. |
| Z AXIS EXTERNAL | 0.05 | 4.02 | -16.41 | 183. | 88. |
| RESULTANT | 0.38 | 18.80 | -0.50 | 88. | 21. |
| NORM RESULTANT | 0.10 | 1.89 | -0.05 | 88. | 21. |
| AT EXTERNAL | -1.11 | 506.58 | -269.19 | 122. | 242. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 3.61 | -15.01 | 184. | 88. |
| Y AXIS EXTERNAL | -0.01 | 1.83 | -1.81 | 210. | 94. |
| Z AXIS EXTERNAL | 0.07 | 6.04 | -1.06 | 49. | 33. |
| RESULTANT | 1.00 | 15.13 | -0.87 | 88. | 279. |
| NORM RESULTANT | 0.10 | 1.52 | -0.09 | 88. | 279. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.98 | -15.55 | 185. | 88. |
| Y AXIS EXTERNAL | 0.00 | 3.43 | -1.53 | 74. | 26. |
| Z AXIS EXTERNAL | 0.07 | 12.27 | -1.27 | 71. | 182. |
| RESULTANT | 1.00 | 18.57 | -0.37 | 88. | 243. |
| NORM RESULTANT | 0.10 | 1.86 | -0.04 | 88. | 243. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 68.93 | 958.13 | 22.92 | 89. | 195. |
| LEFT TENSION QRA | 28.82 | 100.05 | 19.91 | 78. | 178. |
| RIGHT TENSION QRA | 26.53 | 208.69 | 24.48 | 78. | 14. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 19.80 | 207.39 | 12.78 | 77. | 13. |
| RIGHT TENSION QRA | 17.20 | 190.90 | 15.87 | 79. | 7. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 25.62 | 603.77 | -24.69 | 86. | 0. |
| LEFT HORIZ Y AXIS | 2.12 | 68.36 | -0.07 | 87. | 269. |
| LEFT HORIZ Z AXIS | -11.48 | -11.21 | -90.50 | 0. | 89. |
| LEFT HORIZ RESULTANT | 20.14 | 692.05 | 27.16 | 86. | 0. |
| RIGHT HORIZ X AXIS | 26.03 | 680.79 | 23.06 | 86. | 445. |
| RIGHT HORIZ Y AXIS | 0.94 | 78.52 | -0.54 | 85. | 194. |
| RIGHT HORIZ Z AXIS | 0.26 | 31.06 | -5.65 | 83. | 41. |
| RIGHT HORIZ RESULTANT | 25.06 | 695.66 | 23.08 | 86. | 445. |
| AT VERTICAL X AXIS | -7.31 | 27.59 | -8.76 | 95. | 0. |
| AT VERTICAL Y AXIS | 3.07 | 8.58 | 1.05 | 61. | 255. |
| AT VERTICAL Z AXIS | 51.45 | 849.51 | 58.38 | 88. | 24. |
| AT VERTICAL RESULTANT | 52.12 | 850.04 | 58.49 | 86. | 24. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 20.47 | 48.83 | -187.50 | 332. | 84. |
| RIGHT LINK X AXIS | 15.35 | 31.00 | -129.95 | 323. | 82. |
| X AXIS SUM | 49.81 | 78.50 | -317.45 | 332. | 84. |
| X AXIS MINUS TARE | 49.95 | 95.55 | -175.71 | 50. | 88. |
| CENTER LINK Y AXIS | -62.83 | -16.86 | -227.59 | 448. | 89. |
| LEFT Z AXIS | 20.47 | 605.09 | 25.39 | 90. | 319. |
| RIGHT Z AXIS | 18.22 | 683.81 | 20.18 | 89. | 319. |
| CENTER Z AXIS | 161.62 | 943.21 | 160.52 | 90. | 2. |
| Z AXIS SUM | 229.82 | 2241.91 | 223.10 | 90. | 2. |
| Z AXIS MINUS TARE | 229.37 | 2148.22 | 220.80 | 90. | 2. |
| RESULTANT | 238.77 | 2279.78 | 233.02 | 90. | 2. |
| RESULTANT MINUS TARE | 238.65 | 2167.34 | 231.67 | 90. | 2. |

CREST STUDY -GX TEST: 9112 SUBJ: 9121 WT: 128.0 NORM G: 10.0 CELL: D

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|---------------------|-----------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 -9.99 | -147. 82. 17. | 236. 36. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.44 | -9.94 | 157. | 57. |
| Y AXIS | 0.00 | 0.17 | -0.21 | 358. | 81. |
| Z AXIS | 1.00 | 2.43 | -0.73 | 56. | 52. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 3.04 | -10.17 | 158. | 50. |
| Y AXIS | 0.00 | 1.08 | -1.34 | 180. | 171. |
| Z AXIS | 0.87 | 6.44 | -0.80 | 57. | 164. |
| SLED VELOCITY (FT/S) | 0.00 | 30.54 | 0.00 | 156. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.32 | -11.32 | 167. | 87. |
| Y AXIS EXTERNAL | 0.00 | 4.39 | -2.05 | 119. | 126. |
| Z AXIS EXTERNAL | 0.86 | 6.73 | -0.76 | 89. | 163. |
| RESULTANT | 0.98 | 14.98 | -0.32 | 88. | 159. |
| NORM RESULTANT | 0.10 | 1.51 | -0.03 | 88. | 159. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.51 | 1.93 | -9.92 | 198. | 79. |
| Y AXIS EXTERNAL | 0.04 | 0.66 | -1.65 | 123. | 81. |
| Z AXIS EXTERNAL | 0.88 | 9.47 | -18.88 | 132. | 79. |
| RESULTANT | 1.01 | 21.38 | -0.95 | 79. | 3. |
| NORM RESULTANT | 0.10 | 2.15 | -0.10 | 79. | 3. |
| AT EXTERNAL | -0.52 | 500.96 | -562.21 | 130. | 79. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.41 | -13.22 | 182. | 66. |
| Y AXIS EXTERNAL | -0.01 | 1.45 | -2.90 | 222. | 109. |
| Z AXIS EXTERNAL | 0.87 | 4.72 | -3.85 | 47. | 88. |
| RESULTANT | 1.00 | 13.73 | -0.51 | 86. | 226. |
| NORM RESULTANT | 0.10 | 1.38 | -0.05 | 86. | 226. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.60 | 4.16 | -10.98 | 160. | 78. |
| Y AXIS EXTERNAL | 0.00 | 10.51 | -1.77 | 64. | 92. |
| Z AXIS EXTERNAL | 0.87 | 19.09 | -1.51 | 64. | 33. |
| RESULTANT | 1.00 | 22.78 | -0.32 | 64. | 189. |
| NORM RESULTANT | 0.10 | 2.29 | -0.03 | 64. | 189. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 74.98 | 673.48 | 69.08 | 84. | 199. |
| LEFT TENSION QRA | 25.08 | 99.08 | 16.08 | 74. | 260. |
| RIGHT TENSION QRA | 31.48 | 145.48 | 26.71 | 76. | 164. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 18.51 | 135.08 | 17.85 | 75. | 7. |
| RIGHT TENSION QRA | 15.92 | 89.43 | 14.79 | 75. | 1. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 51.93 | 405.86 | 42.75 | 72. | 447. |
| LEFT HORIZ Y AXIS | 7.28 | 62.91 | -2.60 | 74. | 183. |
| LEFT HORIZ Z AXIS | -17.28 | -17.14 | -79.19 | 0. | 78. |
| LEFT HORIZ RESULTANT | 55.21 | 418.06 | 46.32 | 74. | 447. |
| RIGHT HORIZ X AXIS | 37.81 | 338.06 | 31.75 | 76. | 327. |
| RIGHT HORIZ Y AXIS | 5.39 | 57.41 | 2.18 | 78. | 216. |
| RIGHT HORIZ Z AXIS | -0.53 | 0.98 | -12.48 | 162. | 94. |
| RIGHT HORIZ RESULTANT | 38.21 | 343.87 | 31.94 | 76. | 327. |
| AT VERTICAL X AXIS | -0.20 | -2.08 | -33.11 | 49. | 88. |
| AT VERTICAL Y AXIS | 11.15 | 39.86 | 0.74 | 9. | 20. |
| AT VERTICAL Z AXIS | 82.01 | 288.68 | 52.25 | 85. | 19. |
| AT VERTICAL RESULTANT | 83.68 | 271.53 | 53.53 | 85. | 19. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 24.82 | 24.38 | -163.58 | 0. | 69. |
| RIGHT LINK X AXIS | 3.81 | 6.51 | -118.29 | 333. | 77. |
| X AXIS SUM | 28.73 | 27.87 | -271.37 | 0. | 69. |
| X AXIS MINUS TARE | 28.91 | 68.19 | -118.83 | 26. | 78. |
| CENTER LINK Y AXIS | -25.18 | -5.12 | -152.08 | 203. | 66. |
| LEFT Z AXIS | 35.18 | 302.47 | 31.87 | 70. | 191. |
| RIGHT Z AXIS | 30.15 | 297.08 | 7.52 | 79. | 313. |
| CENTER Z AXIS | 123.04 | 689.64 | 129.84 | 79. | 0. |
| Z AXIS SUM | 167.16 | 1918.22 | 100.25 | 75. | 0. |
| Z AXIS MINUS TARE | 167.08 | 1226.01 | 106.18 | 75. | 3. |
| RESULTANT | 161.04 | 1962.57 | 191.09 | 75. | 0. |
| RESULTANT MINUS TARE | 160.87 | 1242.54 | 190.03 | 75. | 1. |

CREST STUDY -CX TEST: 9111 SUBJ: N20 WT: 192.0 NORM G: 10.0 CELL: 0

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|---------------------|-----------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 9.99 | -139. 158. 1. | 0. 9. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.54 | -10.00 | 157. | 55. |
| Y AXIS | 0.00 | 0.34 | -0.95 | 243. | 313. |
| Z AXIS | 1.00 | 2.51 | -0.66 | 54. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 2.93 | -10.16 | 158. | 48. |
| Y AXIS | 0.00 | 1.22 | -0.99 | 224. | 217. |
| Z AXIS | 0.87 | 8.05 | -0.62 | 55. | 164. |
| SLED VELOCITY (FT/S) | 0.00 | 30.48 | 0.00 | 157. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.50 | 2.01 | -17.31 | 185. | 87. |
| Y AXIS EXTERNAL | 0.00 | 6.32 | -9.09 | 90. | 149. |
| Z AXIS EXTERNAL | 0.87 | 11.43 | -4.44 | 97. | 159. |
| RESULTANT | 1.00 | 20.20 | -0.97 | 98. | 169. |
| NORM RESULTANT | 0.10 | 2.02 | 0.04 | 98. | 169. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.51 | 2.97 | -12.45 | 233. | 102. |
| Y AXIS EXTERNAL | 0.01 | 1.30 | -0.94 | 125. | 174. |
| Z AXIS EXTERNAL | 0.90 | 9.72 | -19.15 | 129. | 93. |
| RESULTANT | 1.03 | 22.15 | 0.79 | 96. | 28. |
| NORM RESULTANT | 0.10 | 2.21 | 0.08 | 96. | 28. |
| AT EXTERNAL | 3.01 | 688.92 | -311.01 | 126. | 212. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.14 | -14.14 | 168. | 83. |
| Y AXIS EXTERNAL | 0.00 | 1.70 | -4.05 | 50. | 59. |
| Z AXIS EXTERNAL | 0.88 | 10.30 | -4.63 | 51. | 93. |
| RESULTANT | 1.01 | 14.71 | 0.74 | 93. | 311. |
| NORM RESULTANT | 0.10 | 1.47 | 0.07 | 93. | 311. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 6.98 | -12.55 | 167. | 74. |
| Y AXIS EXTERNAL | 0.00 | 8.89 | -2.55 | 58. | 165. |
| Z AXIS EXTERNAL | 0.87 | 13.86 | -4.21 | 59. | 165. |
| RESULTANT | 1.00 | 17.20 | 0.22 | 59. | 186. |
| NORM RESULTANT | 0.10 | 1.72 | 0.02 | 59. | 186. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 60.53 | 1021.08 | 44.03 | 89. | 208. |
| LEFT TENSION QRA | 34.43 | 187.01 | 20.43 | 75. | 415. |
| RIGHT TENSION QRA | 36.79 | 244.42 | 36.39 | 77. | 3. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 26.70 | 299.73 | 26.32 | 81. | 0. |
| RIGHT TENSION QRA | 10.98 | 138.92 | 8.00 | 85. | 165. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 85.50 | 710.64 | 51.70 | 82. | 194. |
| LEFT HORIZ Y AXIS | 1.62 | 52.82 | -1.89 | 83. | 185. |
| LEFT HORIZ Z AXIS | -19.04 | -11.10 | -78.89 | 442. | 84. |
| LEFT HORIZ RESULTANT | 57.05 | 717.15 | 54.04 | 84. | 196. |
| RIGHT HORIZ X AXIS | 38.05 | 620.63 | 35.64 | 85. | 194. |
| RIGHT HORIZ Y AXIS | 2.74 | 62.91 | -2.59 | 83. | 194. |
| RIGHT HORIZ Z AXIS | 1.78 | 26.11 | -4.48 | 82. | 159. |
| RIGHT HORIZ RESULTANT | 39.09 | 639.00 | 35.87 | 85. | 196. |
| AT VERTICAL X AXIS | -7.45 | 46.07 | -7.11 | 94. | 0. |
| AT VERTICAL Y AXIS | 1.23 | 8.87 | -2.58 | 165. | 55. |
| AT VERTICAL Z AXIS | 68.42 | 687.84 | 56.89 | 87. | 20. |
| AT VERTICAL RESULTANT | 68.84 | 669.79 | 56.78 | 87. | 20. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 18.74 | 62.38 | -200.25 | 178. | 80. |
| RIGHT LINK X AXIS | 15.01 | 68.93 | -99.02 | 422. | 80. |
| X AXIS SUM | 31.75 | 128.90 | -209.27 | 422. | 80. |
| X AXIS MINUS TARE | 32.00 | 129.15 | -148.82 | 423. | 86. |
| CENTER LINK Y AXIS | -28.10 | 6.12 | -186.26 | 201. | 77. |
| LEFT Z AXIS | 99.28 | 753.13 | 47.78 | 79. | 191. |
| RIGHT Z AXIS | 45.00 | 555.25 | -2.14 | 81. | 304. |
| CENTER Z AXIS | 167.36 | 1064.86 | 187.84 | 79. | 1. |
| Z AXIS SUM | 282.57 | 2366.00 | 284.89 | 79. | 1. |
| Z AXIS MINUS TARE | 282.41 | 2279.05 | 282.26 | 80. | 1. |
| RESULTANT | 285.04 | 2366.19 | 286.04 | 79. | 1. |
| RESULTANT MINUS TARE | 285.71 | 2281.35 | 286.09 | 80. | 1. |

CREST STUDY -GX TEST: 3110 SUBJ: L-3 WT: 184.0 NOM G: 10.0 CELL: 0

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|--|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MAR 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 2.99 | 8. 5. | 4. 103. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.55 | -9.92 | 157. | 55. |
| Y AXIS | 0.00 | 0.42 | -0.29 | 170. | 125. |
| Z AXIS | 1.00 | 2.51 | -0.72 | 54. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.49 | 2.70 | -10.12 | 160. | 48. |
| Y AXIS | 0.00 | 1.22 | -1.24 | 226. | 173. |
| Z AXIS | 0.87 | 7.99 | -0.87 | 55. | 166. |
| SLED VELOCITY (FT/S) | 0.00 | 30.32 | 0.00 | 155. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.50 | 7.85 | -10.86 | 197. | 87. |
| Y AXIS EXTERNAL | 0.02 | 4.77 | -2.33 | 119. | 210. |
| Z AXIS EXTERNAL | 0.87 | 12.07 | -8.08 | 116. | 191. |
| RESULTANT | 1.00 | 19.32 | 0.71 | 86. | 316. |
| NORM RESULTANT | 0.10 | 1.34 | 0.07 | 86. | 316. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.33 | -10.32 | 343. | 120. |
| Y AXIS EXTERNAL | 0.01 | 1.27 | -1.21 | 93. | 194. |
| Z AXIS EXTERNAL | 0.78 | 5.02 | -12.36 | 178. | 89. |
| RESULTANT | 0.91 | 15.01 | 0.19 | 89. | 207. |
| NORM RESULTANT | 0.08 | 1.51 | 0.02 | 89. | 207. |
| RT EXTERNAL | -0.04 | 587.45 | -321.06 | 144. | 80. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.34 | -11.05 | 183. | 82. |
| Y AXIS EXTERNAL | 0.01 | 5.83 | -2.58 | 52. | 40. |
| Z AXIS EXTERNAL | 0.88 | 8.24 | -2.49 | 51. | 37. |
| RESULTANT | 1.00 | 12.86 | 0.51 | 51. | 158. |
| NORM RESULTANT | 0.10 | 1.28 | 0.05 | 51. | 158. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.68 | -10.98 | 183. | 83. |
| Y AXIS EXTERNAL | -0.01 | 2.58 | -1.94 | 72. | 64. |
| Z AXIS EXTERNAL | 0.68 | 26.64 | -7.01 | 72. | 171. |
| RESULTANT | 1.00 | 29.79 | 0.20 | 73. | 248. |
| NORM RESULTANT | 0.10 | 3.00 | 0.02 | 73. | 248. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 108.69 | 758.41 | 53.00 | 91. | 234. |
| LEFT TENSION QRA | 48.88 | 178.79 | 23.69 | 82. | 184. |
| RIGHT TENSION QRA | 39.84 | 198.13 | 33.30 | 78. | 178. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 26.48 | 188.95 | 18.86 | 77. | 177. |
| RIGHT TENSION QRA | 18.66 | 141.00 | 13.15 | 77. | 175. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 81.10 | 818.73 | 46.38 | 83. | 197. |
| LEFT HORIZ Y AXIS | 6.10 | 72.32 | 1.58 | 85. | 186. |
| LEFT HORIZ Z AXIS | -18.18 | -15.28 | -93.42 | 202. | 87. |
| LEFT HORIZ RESULTANT | 83.95 | 825.55 | 49.23 | 83. | 200. |
| RIGHT HORIZ X AXIS | 51.58 | 685.31 | 40.47 | 81. | 419. |
| RIGHT HORIZ Y AXIS | 8.11 | 76.70 | 2.21 | 80. | 196. |
| RIGHT HORIZ Z AXIS | 1.43 | 22.81 | -3.08 | 81. | 28. |
| RIGHT HORIZ RESULTANT | 51.97 | 680.58 | 40.78 | 81. | 457. |
| RT VERTICAL X AXIS | -14.79 | 8.75 | -14.52 | 103. | 0. |
| RT VERTICAL Y AXIS | 4.30 | 12.24 | 2.58 | 70. | 27. |
| RT VERTICAL Z AXIS | 78.82 | 389.14 | 70.35 | 84. | 21. |
| RT VERTICAL RESULTANT | 80.30 | 383.27 | 71.18 | 84. | 21. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 8.11 | 30.17 | -178.25 | 179. | 79. |
| RIGHT LINK X AXIS | 31.48 | 57.03 | -114.41 | 448. | 81. |
| X AXIS SUM | 34.57 | 77.60 | -291.50 | 467. | 80. |
| X AXIS MINUS TARE | 34.73 | 82.38 | -130.43 | 48. | 85. |
| CENTER LINK Y AXIS | 87.12 | 71.33 | -39.99 | 204. | 77. |
| LEFT Z AXIS | 54.22 | 126.74 | 5.86 | 77. | 283. |
| RIGHT Z AXIS | 41.71 | 618.38 | 28.55 | 80. | 421. |
| CENTER Z AXIS | 177.10 | 812.89 | 162.78 | 119. | 0. |
| Z AXIS SUM | 278.12 | 1938.88 | 262.29 | 79. | 0. |
| Z AXIS MINUS TARE | 273.04 | 1841.58 | 278.81 | 79. | 1. |
| RESULTANT | 288.37 | 1880.85 | 261.80 | 79. | 1. |
| RESULTANT MINUS TARE | 283.31 | 1848.12 | 268.95 | 79. | 1. |

CREST STUDY -GX TEST: 3109 SUBJ: K-3 WT: 138.0 NORM G: 10.0 CELL: 0

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 9.99 | -137. 9. 65. | 144. 12. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.01 | 0.54 | -9.98 | 175. | 57. |
| Y AXIS | 0.00 | 0.32 | -0.22 | 174. | 62. |
| Z AXIS | 1.00 | 2.38 | -0.87 | 56. | 52. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 2.47 | -10.21 | 156. | 50. |
| Y AXIS | 0.00 | 1.19 | -1.07 | 229. | 169. |
| Z AXIS | 0.67 | 8.03 | -0.12 | 57. | 161. |
| SLED VELOCITY (FT/S) | 0.00 | 30.60 | 0.00 | 159. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.31 | -12.55 | 178. | 87. |
| Y AXIS EXTERNAL | 0.00 | 9.97 | -0.90 | 95. | 151. |
| Z AXIS EXTERNAL | 0.87 | 10.52 | -1.09 | 87. | 201. |
| RESULTANT | 1.00 | 15.42 | -0.21 | 88. | 227. |
| NORM RESULTANT | 0.10 | 1.55 | 0.02 | 88. | 227. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.59 | 2.57 | -6.24 | 280. | 120. |
| Y AXIS EXTERNAL | 0.06 | 1.74 | -0.32 | 119. | 174. |
| Z AXIS EXTERNAL | 0.90 | 2.71 | -15.51 | 192. | 79. |
| RESULTANT | 1.04 | 17.64 | -0.99 | 79. | 11. |
| NORM RESULTANT | 0.10 | 1.77 | 0.10 | 79. | 11. |
| RY EXTERNAL | 2.28 | 537.19 | -368.35 | 120. | 70. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.78 | -14.45 | 194. | 86. |
| Y AXIS EXTERNAL | 0.00 | 1.33 | -2.08 | 355. | 90. |
| Z AXIS EXTERNAL | 0.87 | 4.43 | -0.64 | 40. | 89. |
| RESULTANT | 1.00 | 14.54 | -0.89 | 86. | 339. |
| NORM RESULTANT | 0.10 | 1.46 | 0.07 | 86. | 339. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.43 | 2.35 | -13.65 | 163. | 76. |
| Y AXIS EXTERNAL | 0.00 | 3.37 | -2.00 | 68. | 211. |
| Z AXIS EXTERNAL | 0.87 | 6.50 | -0.86 | 78. | 32. |
| RESULTANT | 0.99 | 16.21 | -0.59 | 77. | 219. |
| NORM RESULTANT | 0.10 | 1.62 | 0.06 | 77. | 219. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 60.58 | 691.93 | 11.78 | 87. | 279. |
| LEFT TENSION QRA | 24.81 | 147.48 | 15.08 | 77. | 173. |
| RIGHT TENSION QRA | 26.02 | 157.79 | 24.48 | 78. | 2. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 12.80 | 158.30 | 31.29 | 78. | 181. |
| RIGHT TENSION QRA | 10.88 | 107.87 | 9.57 | 78. | 1. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 32.55 | 540.49 | 29.44 | 83. | 333. |
| LEFT HORIZ Y AXIS | 4.34 | 71.65 | -0.90 | 86. | 204. |
| LEFT HORIZ Z AXIS | -14.30 | -12.23 | -66.92 | 337. | 63. |
| LEFT HORIZ RESULTANT | 35.03 | 551.98 | 27.07 | 83. | 333. |
| RIGHT HORIZ X AXIS | 28.82 | 548.48 | 21.18 | 83. | 464. |
| RIGHT HORIZ Y AXIS | 3.24 | 78.86 | -1.05 | 83. | 192. |
| RIGHT HORIZ Z AXIS | 0.88 | 12.24 | -7.34 | 78. | 46. |
| RIGHT HORIZ RESULTANT | 29.05 | 546.49 | 21.29 | 83. | 464. |
| RT VERTICAL X AXIS | -10.59 | -2.79 | -36.04 | 36. | 75. |
| RT VERTICAL Y AXIS | 6.18 | 46.31 | 5.44 | 83. | 1. |
| RT VERTICAL Z AXIS | 36.73 | 946.11 | 28.39 | 86. | 24. |
| RT VERTICAL RESULTANT | 38.73 | 350.83 | 30.31 | 86. | 24. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 14.27 | 38.68 | -166.78 | 943. | 85. |
| RIGHT LINK X AXIS | 33.06 | 42.48 | -87.48 | 466. | 83. |
| X AXIS SUM | 47.33 | 73.75 | -264.26 | 466. | 85. |
| X AXIS MINUS TARE | 47.84 | 87.33 | -128.86 | 38. | 87. |
| CENTER LINK Y AXIS | 52.31 | 98.13 | -65.94 | 223. | 89. |
| LEFT Z AXIS | 38.00 | 478.27 | 4.46 | 84. | 368. |
| RIGHT Z AXIS | 18.29 | 362.68 | 4.69 | 83. | 329. |
| CENTER Z AXIS | 134.82 | 758.81 | 195.18 | 92. | 0. |
| Z AXIS SUM | 192.21 | 1695.58 | 175.91 | 83. | 224. |
| Z AXIS MINUS TARE | 192.18 | 1509.80 | 179.38 | 85. | 224. |
| RESULTANT | 204.75 | 1621.56 | 164.27 | 83. | 234. |
| RESULTANT MINUS TARE | 204.70 | 1516.28 | 166.42 | 85. | 224. |

CREST STUDY -GX TEST: 3108 SUBJ: 8-1 WT: 166.0 NORM G: 10.0 CELL: 0

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|------------------------|------------------|------------------|----------------------|--------------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 3.99 | -130. 24. 322. | 142. 4. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.50 | -9.95 | 157. | 55. |
| Y AXIS | 0.00 | 0.22 | -0.22 | 324. | 58. |
| Z AXIS | 1.00 | 2.58 | -0.71 | 55. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 2.98 | -10.15 | 158. | 49. |
| Y AXIS | 0.00 | 1.19 | -1.34 | 225. | 172. |
| Z AXIS | 0.87 | 8.13 | -0.56 | 55. | 164. |
| SLED VELOCITY (FT/S) | 0.00 | 30.82 | 0.00 | 161. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.44 | 3.43 | -11.92 | 185. | 70. |
| Y AXIS EXTERNAL | -0.05 | 6.73 | -1.77 | 72. | 180. |
| Z AXIS EXTERNAL | 0.86 | 10.16 | -1.58 | 86. | 172. |
| RESULTANT | 0.97 | 14.55 | -2.27 | 86. | 208. |
| NORM RESULTANT | 0.10 | 1.48 | -0.03 | 86. | 208. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.65 | 2.05 | -7.60 | 195. | 100. |
| Y AXIS EXTERNAL | 0.09 | 0.42 | -0.91 | 232. | 192. |
| Z AXIS EXTERNAL | 0.91 | 3.55 | -0.87 | 178. | 76. |
| RESULTANT | 1.12 | 11.25 | -0.54 | 91. | 18. |
| NORM RESULTANT | 0.11 | 1.19 | -0.05 | 91. | 18. |
| AT EXTERNAL | -4.01 | 301.40 | -229.64 | 119. | 218. |
| THORAX ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 3.79 | -11.34 | 183. | 85. |
| Y AXIS EXTERNAL | 0.00 | 1.61 | -1.73 | 207. | 62. |
| Z AXIS EXTERNAL | 0.87 | 15.51 | -0.17 | 53. | 40. |
| RESULTANT | 1.00 | 16.41 | -0.66 | 53. | 223. |
| NORM RESULTANT | 0.10 | 1.65 | -0.07 | 53. | 223. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 10.98 | -12.41 | 171. | 76. |
| Y AXIS EXTERNAL | 0.00 | 4.08 | -3.74 | 66. | 77. |
| Z AXIS EXTERNAL | 0.87 | 18.77 | -9.15 | 67. | 164. |
| RESULTANT | 1.00 | 20.54 | -0.50 | 67. | 222. |
| NORM RESULTANT | 0.10 | 2.08 | -0.05 | 67. | 222. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 159.66 | 683.00 | 59.81 | 90. | 181. |
| LEFT TENSION QRA | 53.28 | 155.78 | 20.99 | 88. | 178. |
| RIGHT TENSION QRA | 36.65 | 146.93 | 16.05 | 85. | 179. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 10.76 | 110.33 | 7.85 | 86. | 172. |
| RIGHT TENSION QRA | 17.01 | 84.18 | 7.72 | 87. | 165. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 67.69 | 478.84 | -20.80 | 85. | 469. |
| LEFT HORIZ Y AXIS | 0.33 | 36.21 | 4.89 | 86. | 186. |
| LEFT HORIZ Z AXIS | -21.57 | -10.27 | -75.72 | 394. | 69. |
| LEFT HORIZ RESULTANT | 71.48 | 465.30 | 20.08 | 86. | 469. |
| RIGHT HORIZ X AXIS | 61.81 | 474.93 | 38.01 | 86. | 181. |
| RIGHT HORIZ Y AXIS | 0.16 | 31.39 | 1.03 | 85. | 173. |
| RIGHT HORIZ Z AXIS | 1.12 | 15.81 | -5.18 | 84. | 54. |
| RIGHT HORIZ RESULTANT | 61.93 | 476.54 | 36.03 | 86. | 448. |
| AT VERTICAL X AXIS | -18.58 | 2.33 | -19.83 | 453. | 74. |
| AT VERTICAL Y AXIS | 12.38 | 34.14 | 10.40 | 87. | 26. |
| AT VERTICAL Z AXIS | 125.48 | 930.37 | 102.18 | 86. | 36. |
| AT VERTICAL RESULTANT | 127.60 | 332.73 | 102.92 | 87. | 38. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 22.64 | 87.35 | -139.03 | 159. | 82. |
| RIGHT LINK X AXIS | 7.59 | 11.84 | -121.02 | 459. | 92. |
| X AXIS SUM | 30.23 | 98.47 | -256.54 | 459. | 82. |
| X AXIS MINUS TARE | 30.64 | 70.53 | -109.57 | 48. | 68. |
| CENTER LINK Y AXIS | -35.78 | -3.70 | -165.68 | 201. | 79. |
| LEFT Z AXIS | 68.84 | 682.52 | -2.70 | 81. | 191. |
| RIGHT Z AXIS | 43.39 | 366.19 | 43.83 | 81. | 3. |
| CENTER Z AXIS | 266.17 | 882.59 | 255.47 | 91. | 201. |
| Z AXIS SUM | 364.41 | 1747.01 | 911.89 | 82. | 201. |
| Z AXIS MINUS TARE | 364.24 | 1658.88 | 818.51 | 82. | 214. |
| RESULTANT | 367.41 | 1778.21 | 812.28 | 82. | 201. |
| RESULTANT MINUS TARE | 367.28 | 1670.28 | 918.70 | 82. | 214. |

CREST STUDY -GX TEST: 3079 SUBJ: R-8 WT: 169.0 NORM G: 10.0 CELL: D

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|---|---------------------|---------------|---------------|---------------------|-----------------|
| REFERENCE MARK 2.5V EXT PWR 10V EXT PWR | | 2.50 10.01 | 2.50 2.98 | -89. 14. 368. | 1. 7. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.09 | 0.52 | -9.84 | 158. | 55. |
| Y AXIS | 0.00 | 0.25 | -0.25 | 302. | 123. |
| Z AXIS | 1.00 | 2.54 | -0.63 | 54. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.48 | 2.53 | -10.05 | 160. | 48. |
| Y AXIS | 0.00 | 1.40 | -1.31 | 180. | 173. |
| Z AXIS | 0.88 | 7.91 | -0.58 | 54. | 166. |
| SLED VELOCITY (FT/S) | 0.00 | 90.35 | 0.00 | 154. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.49 | 4.57 | -12.74 | 148. | 88. |
| Y AXIS EXTERNAL | -0.01 | 6.55 | -8.91 | 155. | 144. |
| Z AXIS EXTERNAL | 0.87 | 14.46 | -7.22 | 145. | 156. |
| RESULTANT | 1.00 | 17.80 | -9.69 | 144. | 316. |
| NORM RESULTANT | 0.10 | 1.81 | 0.07 | 144. | 316. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.48 | 2.12 | -8.65 | 273. | 110. |
| Y AXIS EXTERNAL | 0.02 | 0.49 | -0.70 | 72. | 166. |
| Z AXIS EXTERNAL | 0.83 | 5.30 | -17.09 | 185. | 90. |
| RESULTANT | 0.97 | 16.52 | -9.75 | 90. | 208. |
| NORM RESULTANT | 0.10 | 1.88 | 0.08 | 90. | 208. |
| RY EXTERNAL | -2.13 | 891.80 | -438.79 | 143. | 87. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.47 | 2.34 | -9.88 | 177. | 85. |
| Y AXIS EXTERNAL | 0.00 | 1.06 | -3.83 | 57. | 38. |
| Z AXIS EXTERNAL | 0.88 | 22.62 | -10.86 | 75. | 38. |
| RESULTANT | 1.00 | 24.10 | -9.58 | 75. | 239. |
| NORM RESULTANT | 0.10 | 2.45 | 0.06 | 75. | 239. |
| SHOULDER LOADS (LB) | | | | | |
| TENSION | 197.21 | 739.68 | 66.39 | 93. | 210. |
| LEFT TENSION QRA | 55.08 | 146.02 | 34.90 | 76. | 183. |
| RIGHT TENSION QRA | 45.09 | 141.02 | 36.79 | 77. | 165. |
| LEG LOADS (LB) | | | | | |
| LEFT TENSION QRA | 24.65 | 128.53 | 21.27 | 77. | 169. |
| RIGHT TENSION QRA | 40.04 | 116.16 | 36.81 | 77. | 170. |
| ANCHOR LOADS (LB) | | | | | |
| LEFT HORIZ X AXIS | 61.21 | 542.68 | 55.22 | 80. | 505. |
| LEFT HORIZ Y AXIS | 8.57 | 48.29 | 2.18 | 70. | 208. |
| LEFT HORIZ Z AXIS | -17.84 | -17.72 | -74.02 | 0. | 80. |
| LEFT HORIZ RESULTANT | 64.19 | 549.84 | 58.52 | 80. | 513. |
| RIGHT HORIZ X AXIS | 53.06 | 509.03 | 46.17 | 81. | 329. |
| RIGHT HORIZ Y AXIS | 6.99 | 60.87 | 1.80 | 78. | 319. |
| RIGHT HORIZ Z AXIS | 2.69 | 17.55 | -2.03 | 78. | 30. |
| RIGHT HORIZ RESULTANT | 53.56 | 514.06 | 48.40 | 81. | 329. |
| RT VERTICAL X AXIS | -5.05 | 36.12 | -5.98 | 91. | 0. |
| RT VERTICAL Y AXIS | 3.00 | 7.06 | 1.88 | 158. | 25. |
| RT VERTICAL Z AXIS | 80.01 | 327.90 | 78.06 | 88. | 19. |
| RT VERTICAL RESULTANT | 80.21 | 329.78 | 78.11 | 88. | 19. |
| SEAT LOADS (LB) | | | | | |
| LEFT LINK X AXIS | 94.25 | 67.10 | -130.47 | 172. | 82. |
| RIGHT LINK X AXIS | 2.42 | 49.15 | -120.13 | 905. | 79. |
| X AXIS SUM | 86.67 | 61.10 | -249.40 | 514. | 79. |
| X AXIS MINUS TARE | 97.16 | 60.38 | -91.63 | 48. | 85. |
| CENTER LINK Y AXIS | -67.59 | -16.80 | -200.16 | 211. | 75. |
| LEFT Z AXIS | 35.73 | 622.60 | 26.20 | 83. | 221. |
| RIGHT Z AXIS | 42.24 | 487.43 | 13.78 | 85. | 306. |
| CENTER Z AXIS | 204.54 | 1005.10 | 207.18 | 111. | 1. |
| Z AXIS SUM | 282.51 | 1814.91 | 284.83 | 86. | 1. |
| Z AXIS MINUS TARE | 282.29 | 1821.87 | 282.89 | 86. | 1. |
| RESULTANT | 280.64 | 1830.80 | 293.01 | 86. | 1. |
| RESULTANT MINUS TARE | 280.48 | 1834.49 | 281.75 | 86. | 1. |

CREST STUDY -GX TEST: 3094 SUBJ: D-3 WT: 212.0 NOM G: 10.0 CELL: D

| DATA ID | IMMEDIATE PREIMPACT | MAXIMUM VALUE | MINIMUM VALUE | TIME OF MAXIMUM | TIME OF MINIMUM |
|-------------------------|------------------------|------------------|------------------|--------------------|--------------------|
| REFERENCE MARK | | | | -118. | |
| 2.5V EXT PWR | | 2.50 | 2.50 | 2. | |
| 10V EXT PWR | | 10.01 | 9.99 | 22. | 75. |
| SLED ACCELERATION (G) | | | | | |
| X AXIS | -0.02 | 0.48 | -9.95 | 157. | 55. |
| Y AXIS | 0.00 | 0.25 | -0.32 | 295. | 121. |
| Z AXIS | 1.00 | 2.60 | -0.67 | 54. | 50. |
| SEAT ACCELERATION (G) | | | | | |
| X AXIS | 0.49 | 2.48 | -10.12 | 158. | 48. |
| Y AXIS | 0.00 | 1.24 | -1.27 | 178. | 171. |
| Z AXIS | 0.87 | 8.13 | 0.19 | 54. | 163. |
| SLED VELOCITY (FT/S) | 0.00 | 30.17 | 0.00 | 155. | 0. |
| CHEST ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.50 | 9.01 | -15.28 | 172. | 86. |
| Y AXIS EXTERNAL | 0.01 | 6.86 | -2.84 | 93. | 379. |
| Z AXIS EXTERNAL | 0.87 | 19.70 | -2.52 | 66. | 225. |
| RESULTANT | 1.01 | 16.58 | 0.15 | 87. | 194. |
| NORM RESULTANT | 0.10 | 1.67 | 0.02 | 87. | 194. |
| HEAD ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.50 | 3.47 | -10.91 | 266. | 104. |
| Y AXIS EXTERNAL | -0.03 | 1.07 | -1.03 | 201. | 264. |
| Z AXIS EXTERNAL | 0.79 | 3.24 | -14.67 | 132. | 96. |
| RESULTANT | 0.94 | 17.70 | 0.36 | 99. | 306. |
| NORM RESULTANT | 0.09 | 1.78 | 0.04 | 99. | 306. |
| RY EXTERNAL | -5.26 | 535.89 | -334.26 | 128. | 240. |
| LUMBAR ACCELERATION (G) | | | | | |
| X AXIS EXTERNAL | 0.49 | 5.81 | -12.52 | 168. | 80. |
| Y AXIS EXTERNAL | 0.01 | 8.28 | -3.47 | 70. | 163. |
| Z AXIS EXTERNAL | 0.87 | 16.12 | -4.88 | 72. | 163. |
| RESULTANT | 1.00 | 21.95 | 0.12 | 71. | 256. |
| NORM RESULTANT | 0.10 | 2.21 | 0.01 | 71. | 256. |
| SHOULDER LOADS (LBS) | | | | | |
| TENSION | 81.11 | 886.26 | 18.60 | 88. | 478. |
| LEFT TENSION QRA | 56.35 | 168.38 | 93.62 | 81. | 169. |
| RIGHT TENSION QRA | 56.90 | 208.02 | 45.62 | 81. | 169. |
| LEG LOADS (LBS) | | | | | |
| LEFT TENSION QRA | 22.89 | 192.07 | 20.68 | 77. | 480. |
| RIGHT TENSION QRA | 14.96 | 102.47 | 13.64 | 76. | 8. |
| ANCHOR LOADS (LBS) | | | | | |
| LEFT HORIZ X AXIS | 51.45 | 587.78 | 7.58 | 81. | 303. |
| LEFT HORIZ Y AXIS | 2.88 | 10.83 | 1.28 | 84. | 47. |
| LEFT HORIZ Z AXIS | -13.99 | -8.64 | -64.94 | 307. | 76. |
| LEFT HORIZ RESULTANT | 53.40 | 591.52 | 11.75 | 81. | 307. |
| RIGHT HORIZ X AXIS | 47.24 | 572.69 | 13.52 | 83. | 469. |
| RIGHT HORIZ Y AXIS | 2.33 | 49.87 | -9.65 | 83. | 194. |
| RIGHT HORIZ Z AXIS | 0.63 | 11.55 | -6.80 | 81. | 38. |
| RIGHT HORIZ RESULTANT | 47.30 | 574.48 | 13.53 | 83. | 469. |
| AT VERTICAL X AXIS | 0.93 | 53.52 | 0.33 | 91. | 0. |
| AT VERTICAL Y AXIS | 9.28 | 6.86 | 0.41 | 165. | 54. |
| AT VERTICAL Z AXIS | 05.24 | 387.46 | 68.77 | 88. | 487. |
| AT VERTICAL RESULTANT | 05.30 | 390.85 | 70.93 | 88. | 489. |
| SEAT LOADS (LBS) | | | | | |
| LEFT LINK X AXIS | 8.08 | 88.07 | -205.00 | 193. | 81. |
| RIGHT LINK X AXIS | 45.65 | 55.52 | -76.28 | 176. | 68. |
| X AXIS SUM | 61.71 | 111.09 | -278.94 | 193. | 81. |
| X AXIS MINUS TARE | 51.99 | 106.50 | -120.18 | 178. | 76. |
| CENTER LINK Y AXIS | 25.59 | 49.48 | -152.90 | 224. | 77. |
| LEFT Z AXIS | 79.50 | 765.59 | 24.97 | 82. | 472. |
| RIGHT Z AXIS | 45.26 | 552.87 | 3.22 | 79. | 209. |
| CENTER Z AXIS | 261.29 | 1034.73 | 261.53 | 78. | 0. |
| Z AXIS SUM | 380.05 | 2362.29 | 941.74 | 79. | 223. |
| Z AXIS MINUS TARE | 379.94 | 2273.29 | 344.59 | 80. | 215. |
| RESULTANT | 384.40 | 2389.21 | 352.56 | 79. | 223. |
| RESULTANT MINUS TARE | 384.39 | 2280.95 | 356.22 | 80. | 225. |

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